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(54) **BLUE FLUORESCENCE COMPOUND AND ORGANIC ELECTROLUMINESCENCE DEVICE USING THE SAME**

Publication Classification

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(57) **ABSTRACT**

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(30) **Foreign Application Priority Data**

Dec. 29, 2009 (KR) 10-2009-0132606

The present invention relates to a blue fluorescence compound which enables to achieve high brightness, a long life-time and high efficiency; and an organic electroluminescence device thereof.

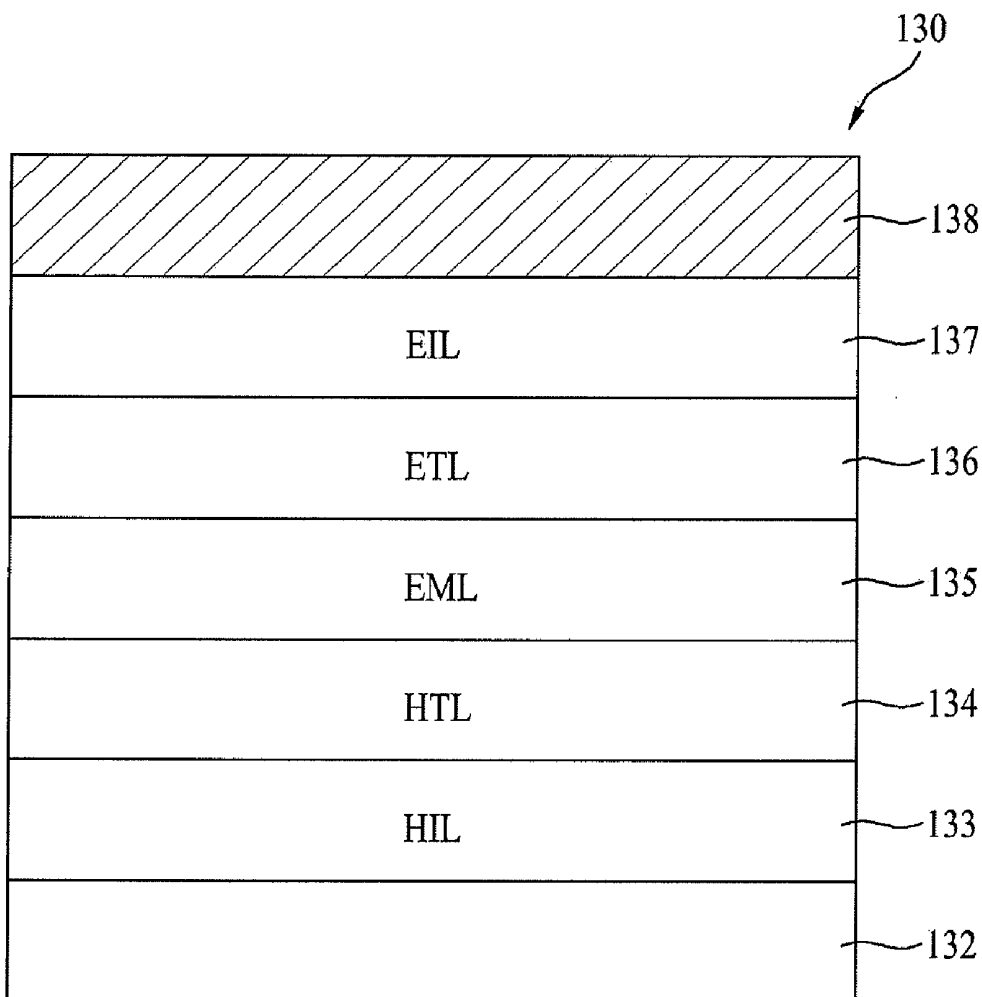
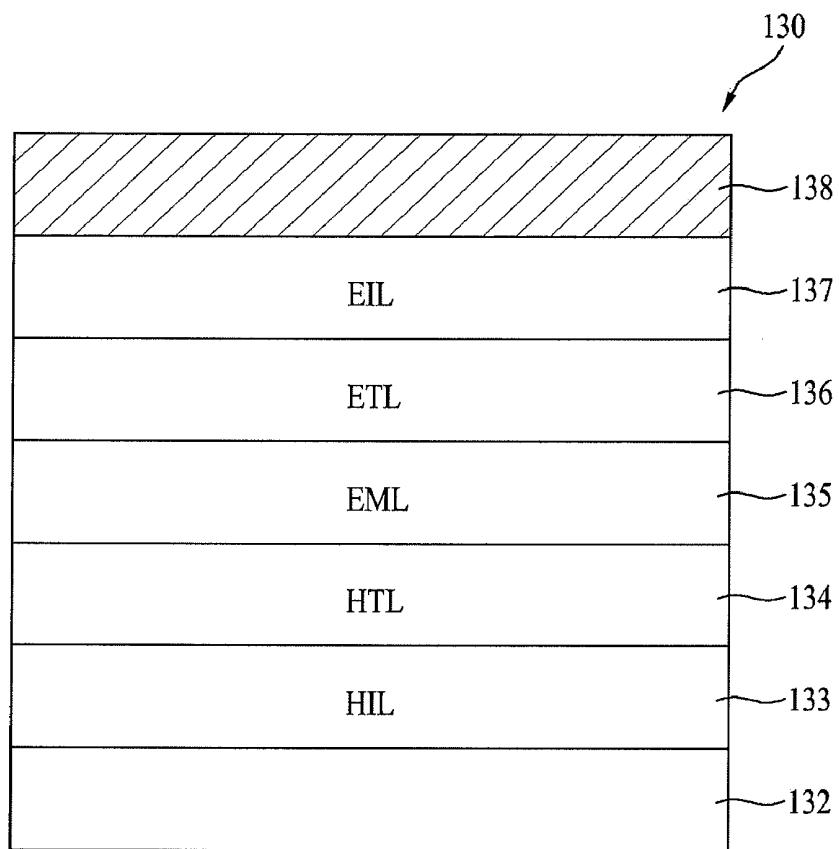


FIG. 1



**BLUE FLUORESCENCE COMPOUND AND
ORGANIC ELECTROLUMINESCENCE
DEVICE USING THE SAME**

CROSS REFERENCE TO RELATED
APPLICATION

[0001] This application claims the benefit of the Korean Patent Application No. 10-2009-0132606, filed on Dec. 29, 2009, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE DISCLOSURE

[0002] 1. Field of the Disclosure

[0003] The present invention relates to a blue fluorescence compound and an organic electroluminescence device thereof, and more particularly, to a blue fluorescence compound which enables to achieve high brightness, a long lifetime and high efficiency; and an organic electroluminescence device using the same.

[0004] 2. Discussion of the Related Art

[0005] Being a core technology in the times of information and communication, an image display device which displays different information in pictures is developing in a direction of being thinner, lighter, and high performance while being portable.

[0006] As various forms of demands on the display devices increases along with recent development of an information oriented society, active researches on flat display devices, such as LCD (Liquid Crystalline Display), PDP (Plasma Display Panel), ELD (Electro Luminescent Display), FED (Field Emission Display) and so on are underway.

[0007] Of the flat display devices, the organic electroluminescence device emits a light as an electron and a hole which form a pair upon injection of charge into an organic electroluminescence layer formed between an electron injection electrode (a cathode) and a hole injection electrode (an anode) annihilate.

[0008] The organic electroluminescence device, not only can be formed on a flexible transparent substrate, such as plastic, but also can be driven by a voltage lower than the plasma display panel or an inorganic electroluminescence device, has comparatively low power consumption and an excellent color feeling.

[0009] The organic electroluminescence layer can emit a light of red, green, or blue color depending on an organic compound included to the electroluminescence layer. As the organic compounds, 2,2-(diaryl)vinylphosphine compound, a compound in which an aryl group is substituted at an end of a diphenylanthracene structure, and so on are known.

[0010] However, since known organic compounds including above compounds have no adequate lifetimes, light emission efficiency, and brightness, and has poor blue color purity, making production of a clean blue color difficult, production of full color display of natural color is difficult.

SUMMARY OF THE DISCLOSURE

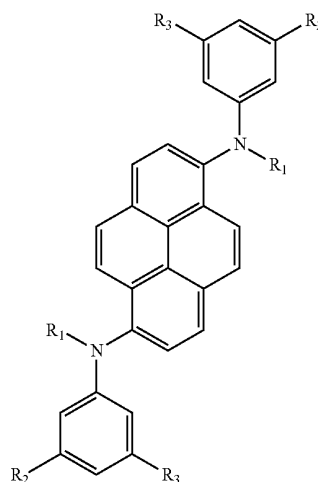
[0011] Accordingly, the present invention is directed to a blue fluorescence compound, and an organic electroluminescence device using the same.

[0012] An object of the present invention is to provide a blue fluorescence compound which enables to achieve high brightness, a long lifetime and high efficiency; and an organic electroluminescence device thereof.

[0013] Additional advantages, objects, and features of the disclosure will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0014] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a blue fluorescence compound consisting of the following chemical formula 1.

[Chemical Formula 1]



[0015] where, R1, R2, and R3 may or may not be identical substances, and each of the R1, R2, and R3 is one of substances selected from an aromatic group, a heterocyclic group, an aliphatic group and hydrogen, independently.

[0016] The organic electroluminescence device of a blue fluorescence compound of the present invention, having an electroluminescence layer between a cathode and an anode, the electroluminescence layer includes a dopant substance and a host substance, wherein the dopant substance has the chemical formula 1.

[0017] Each of the R1, R2, and R3 is one of substances selected from biphenyl, naphthyl, phenanthrene, terphenyl, pyridine, quinoline, deuterium, and a substituent thereof, independently.

[0018] The aromatic group is an aromatic compound having alkyl, alkoxy, halogen, cyano, or silyl group.

[0019] The alkyl group is one selected from methyl, ethyl, propyl, i-propyl, and t-butyl, the alkoxy group is one selected from methoxy, ethoxy, and butoxy, the halogen group is one selected from fluorine and chlorine, and the silyl group is trimethylsilyl.

[0020] The organic electroluminescence device further includes a hole injection layer and a hole transport layer formed between the anode and the electroluminescence layer in succession, and an electron transport layer and an electron injection layer formed between the electroluminescence layer and the cathode in succession.

[0021] Thus, the organic electroluminescence device of a blue fluorescence compound of the present invention permits to drive at a low voltage, and to improve color purity, a lifetime, and light emission efficiency.

[0022] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

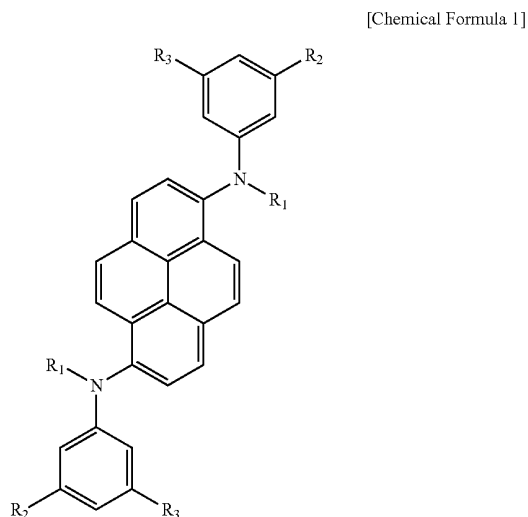
[0023] The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the disclosure and together with the description serve to explain the principle of the disclosure. In the drawings:

[0024] FIG. 1 illustrates a diagram of an organic electroluminescence device in accordance with a preferred embodiment of the present invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0025] Reference will now be made in detail to the specific embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0026] The blue fluorescence compound of the present invention has the following chemical formula 1.



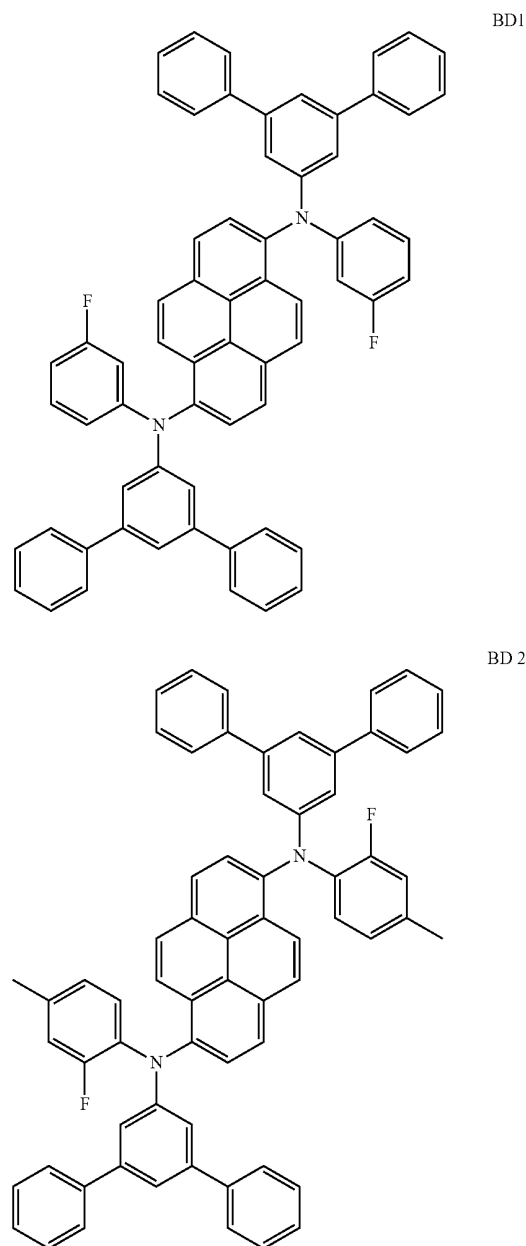
[0027] Where, each of R1, R2, and R3 is one of substances selected from an aromatic group, a heterocyclic group, an aliphatic group and hydrogen which is substituted or not substituted, independently. The R1, R2, and R3 may or may not be identical substances.

[0028] In detail, each of the R1, R2, and R3 may be one of substances selected from the aromatic group including phenyl, biphenyl, naphthyl, phenanthrene, terphenyl, pyridine, quinoline, deuterium, and a substituent thereof.

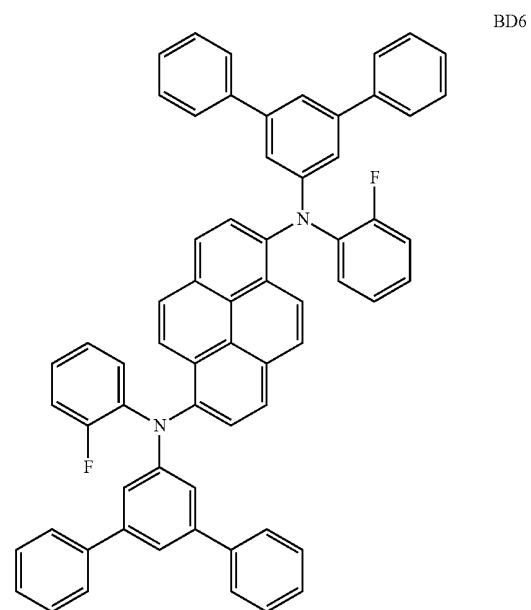
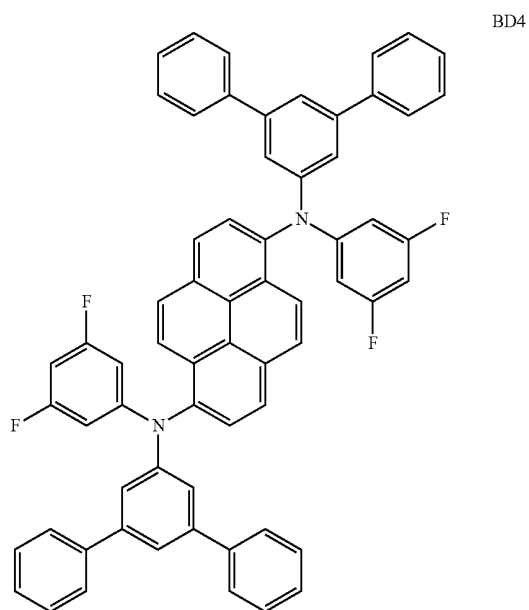
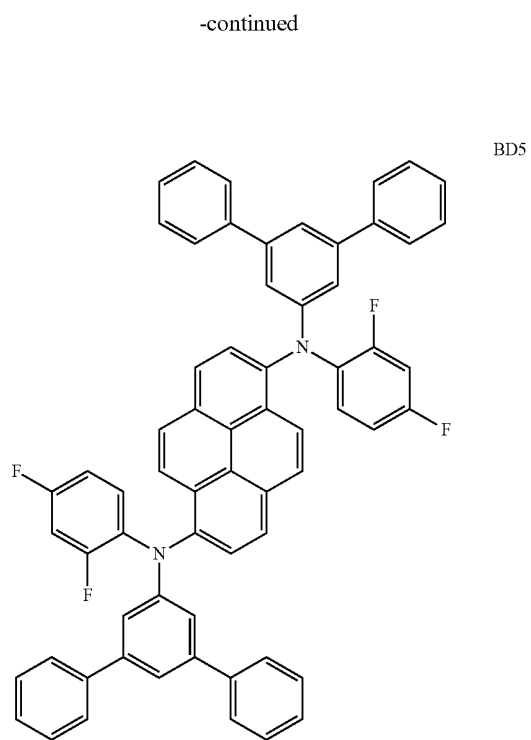
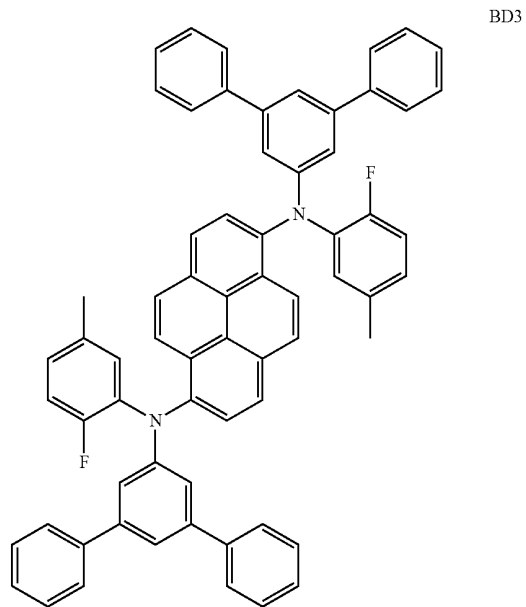
[0029] Or, each of the R1, R2, and R3 may be one of substances selected from aromatic compound having alkyl, alkoxy, halogen, cyano, and silyl groups.

[0030] The alkyl group is one selected from methyl, ethyl, propyl, isopropyl, and t-butyl, and the alkoxy group is one selected from methoxy, ethoxy, and butoxy. The halogen group is one selected from fluorine and chlorine, and the silyl group may be trimethylsilyl.

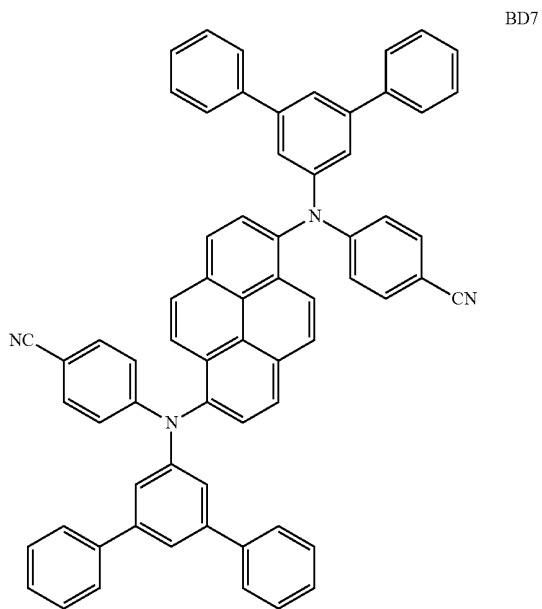
[0031] In detail, the compounds of the chemical formula 1 may be compounds having the following chemical formulae BD-1 to BD-360. However, the compounds of the chemical formula 1 are not limited to those.



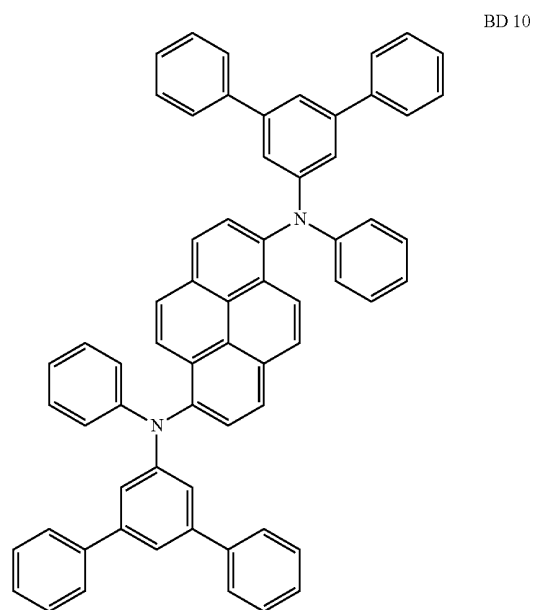
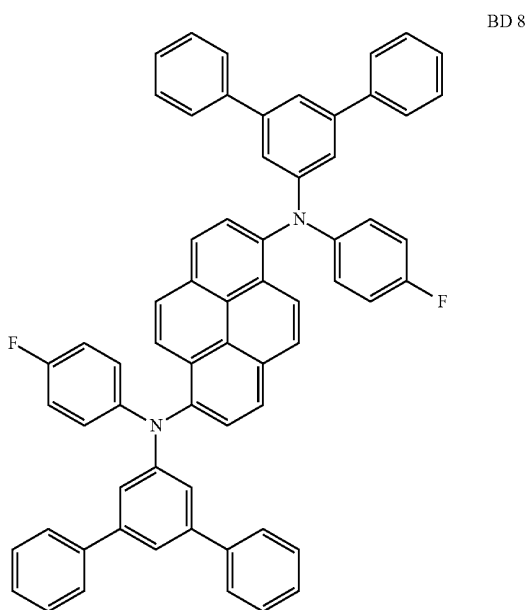
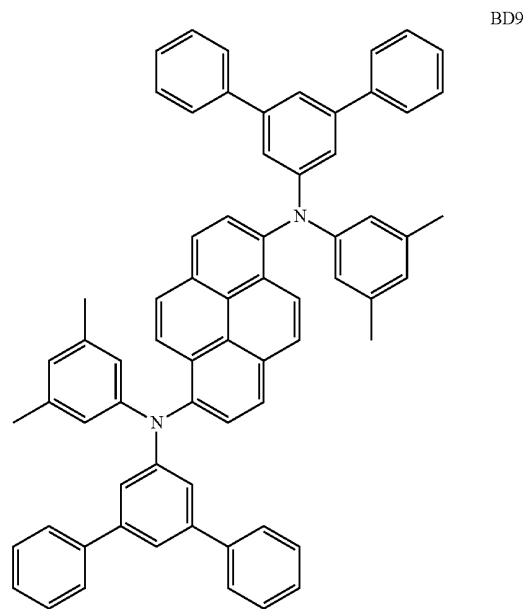
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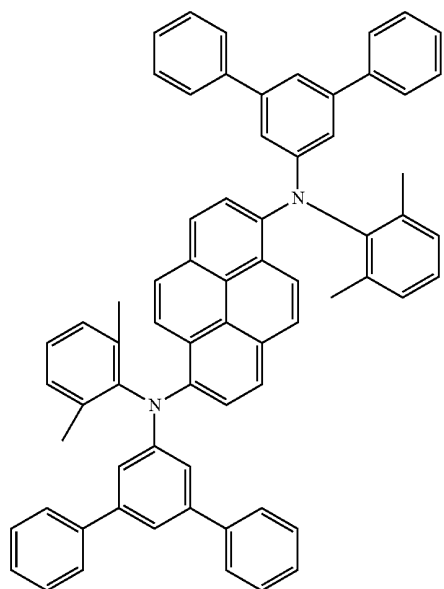


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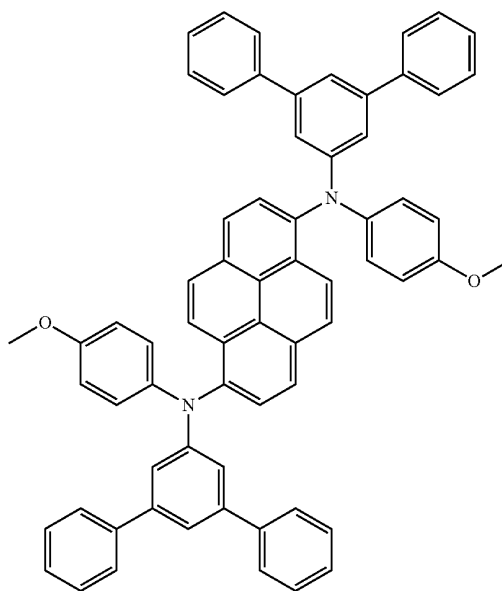
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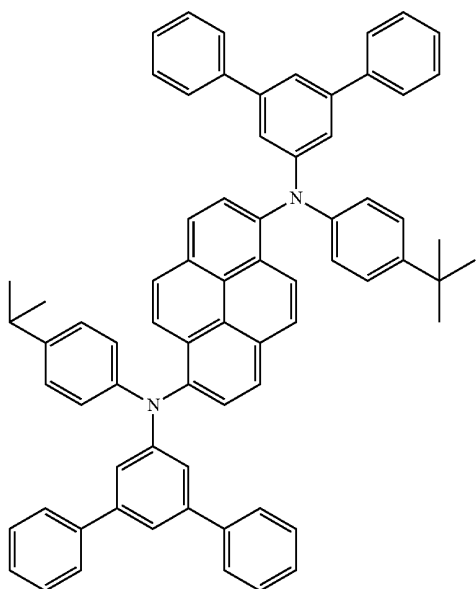


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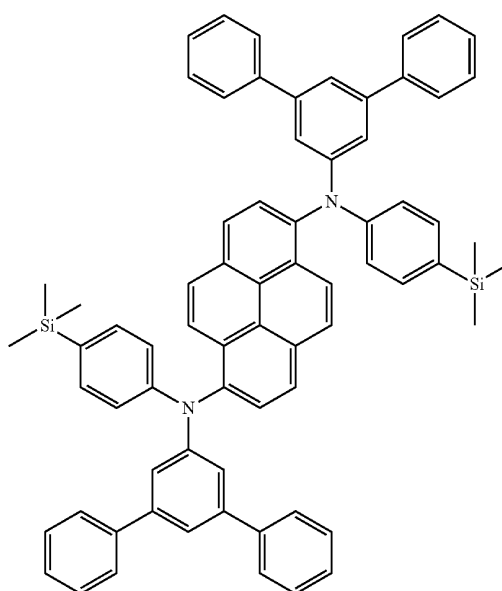
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BD 16

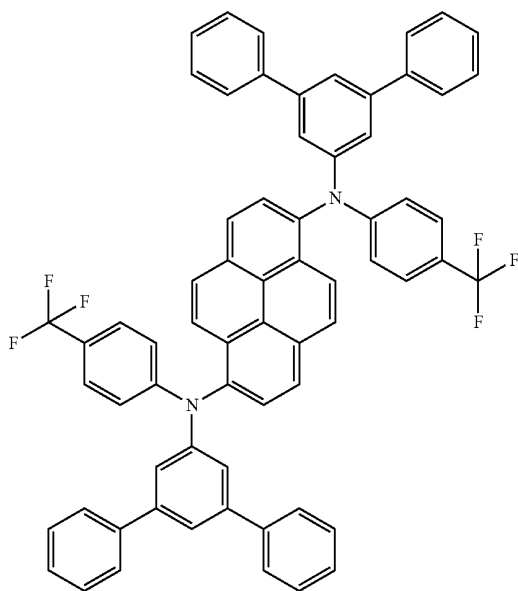


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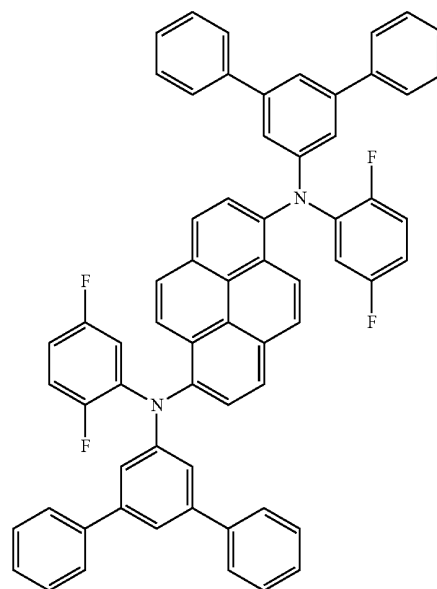
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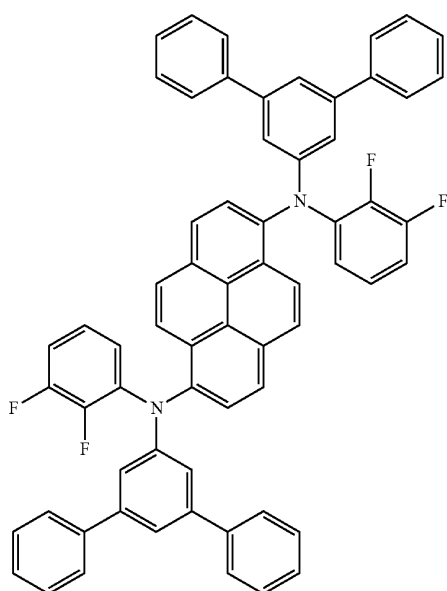


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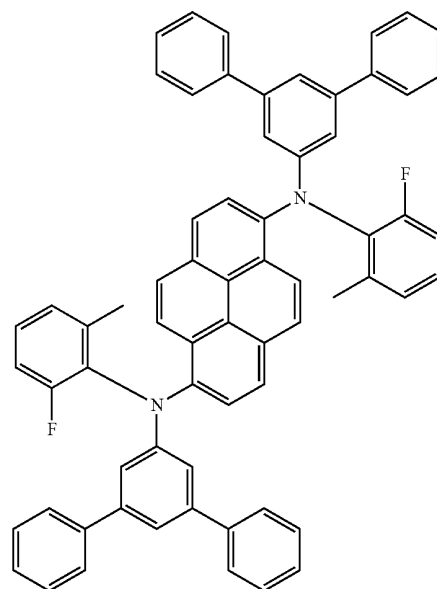
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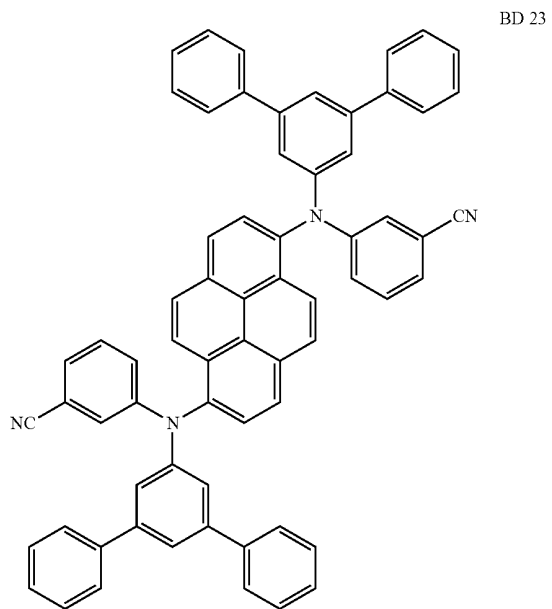
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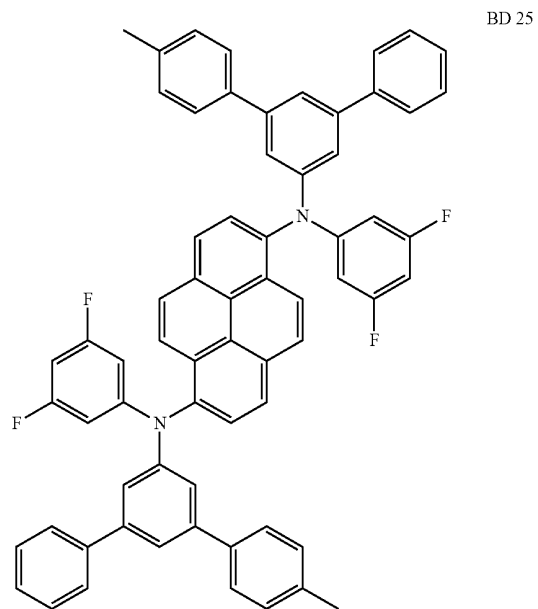
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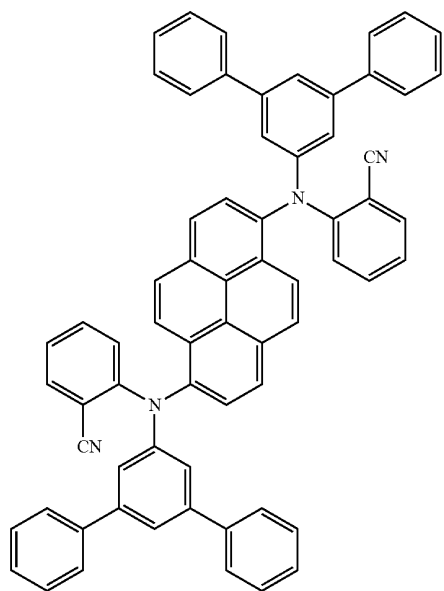
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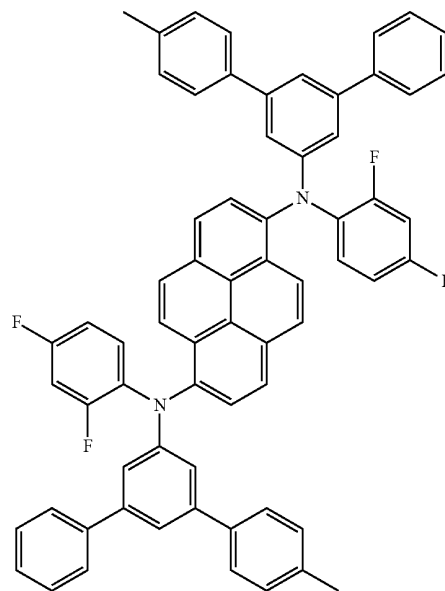
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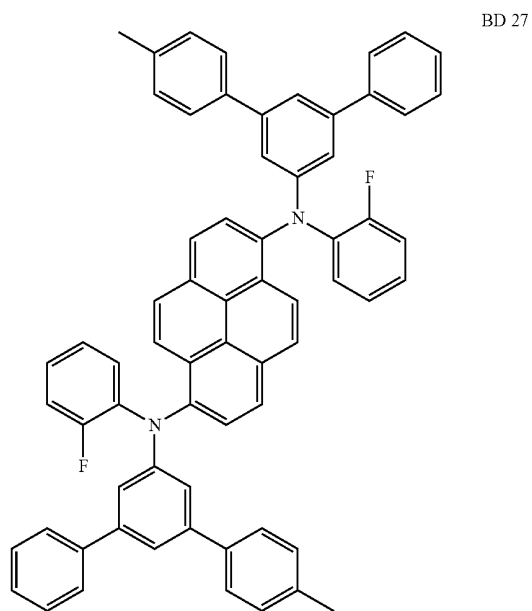
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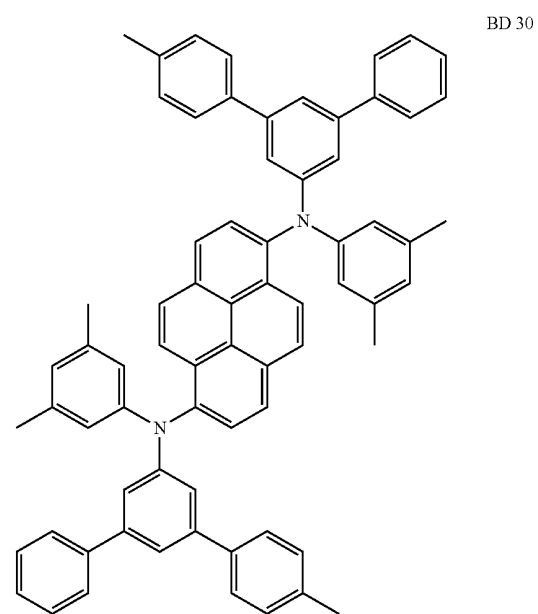
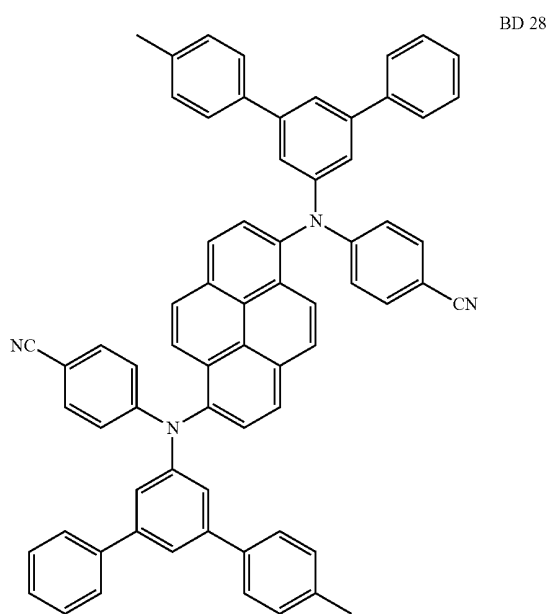
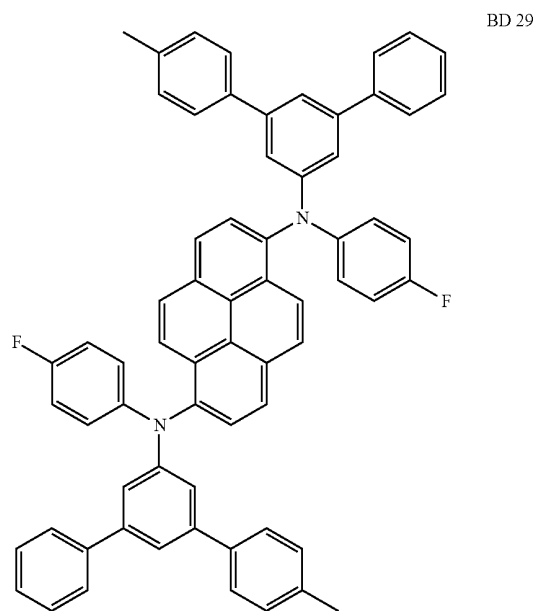
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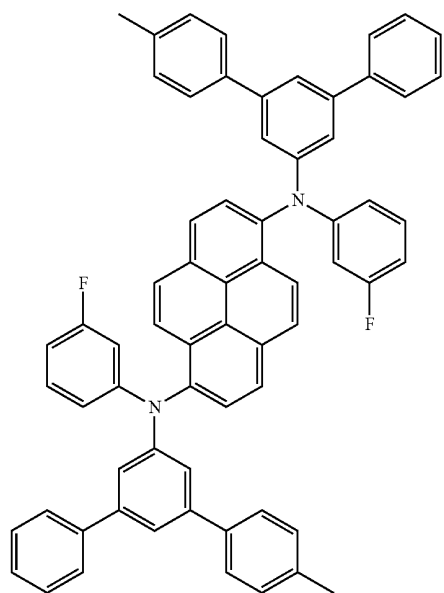
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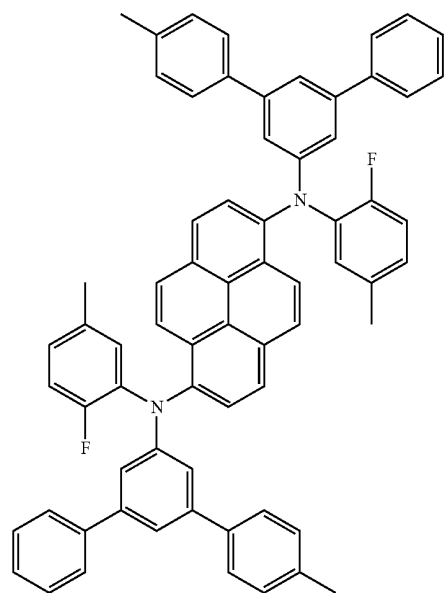
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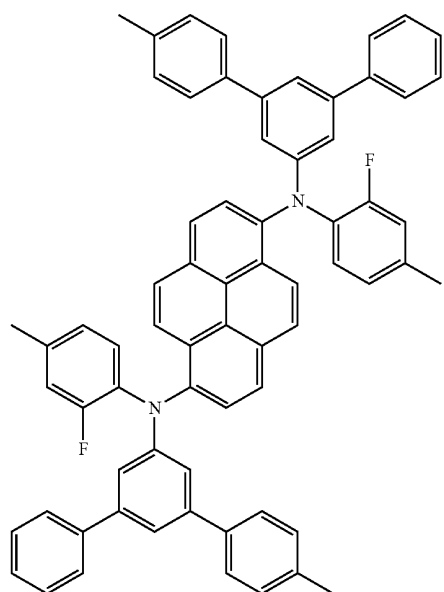
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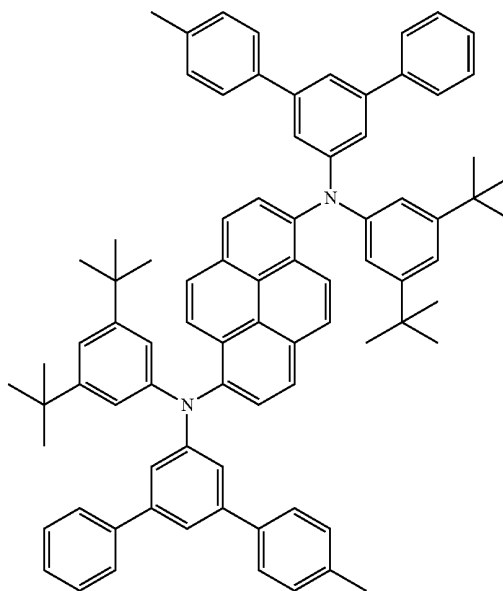
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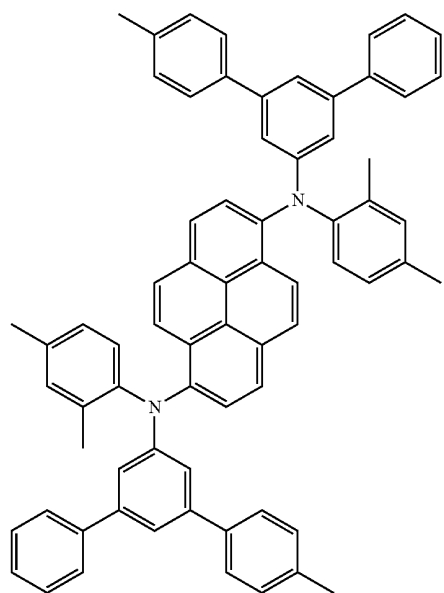
BD 32



BD 34

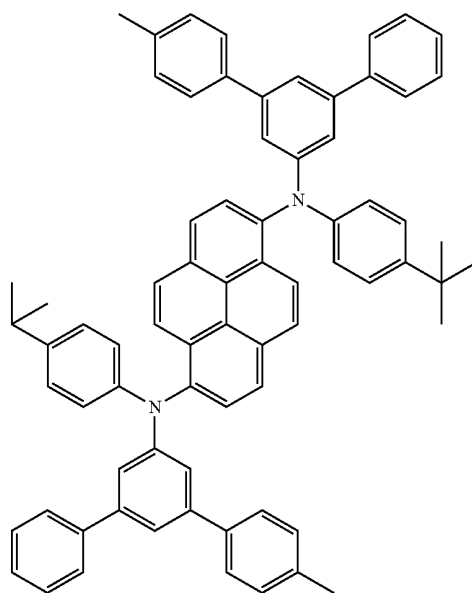


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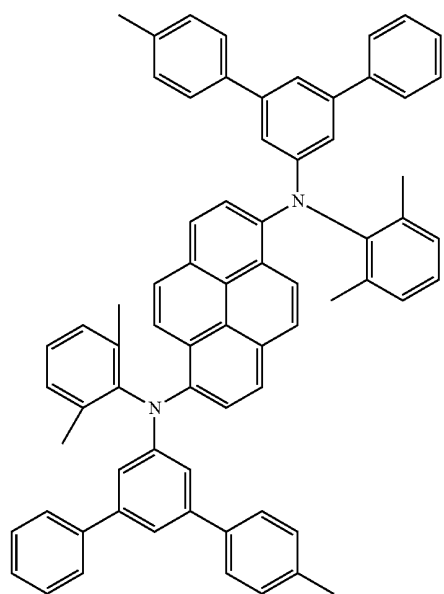


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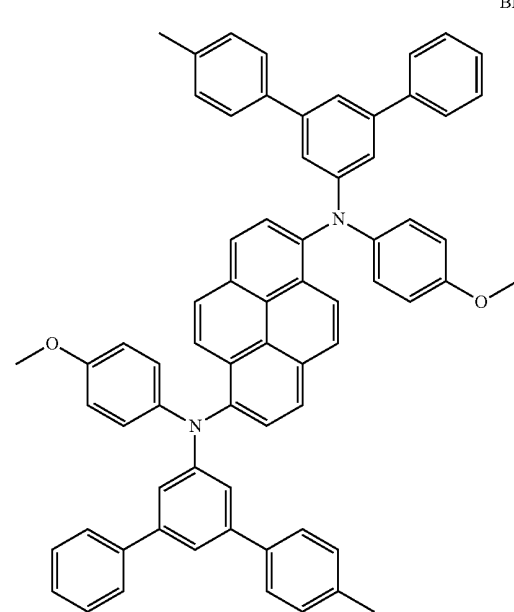
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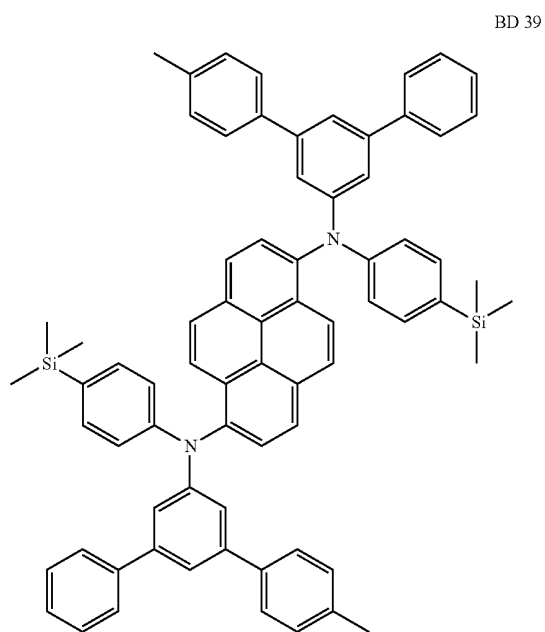


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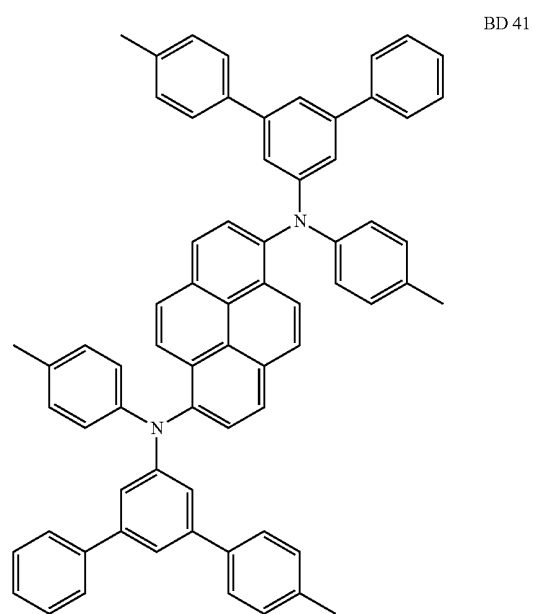


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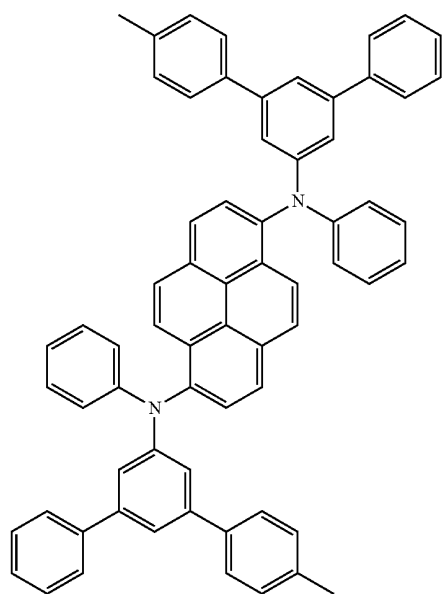
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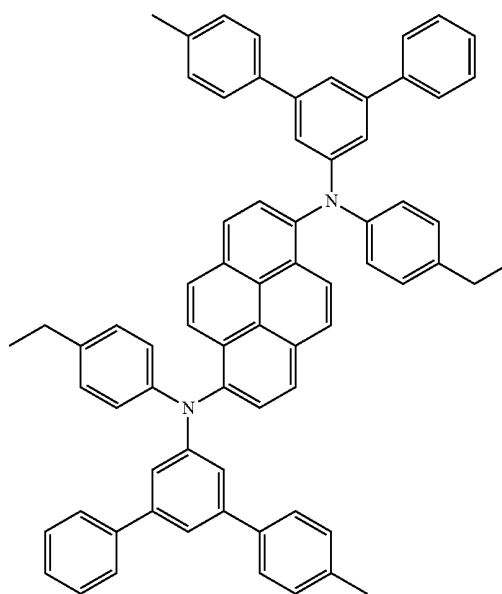
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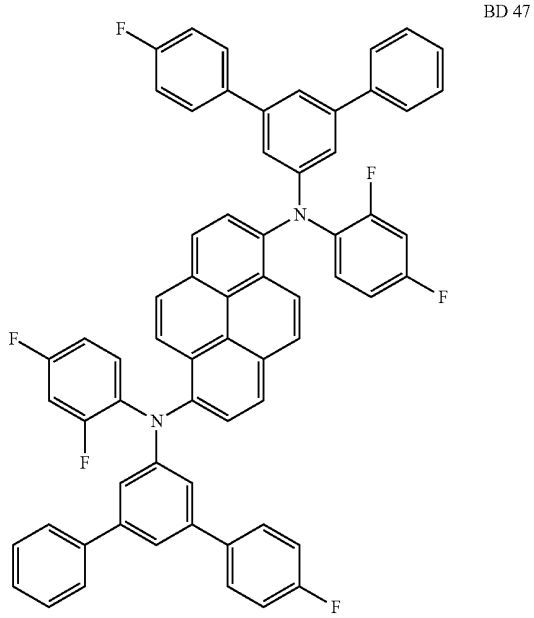
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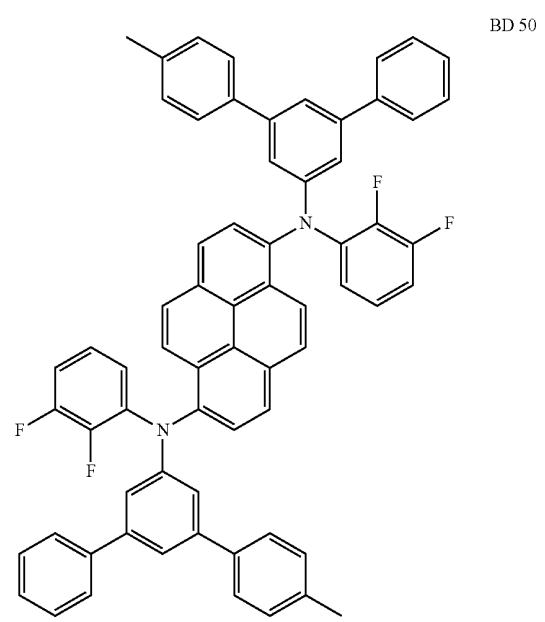
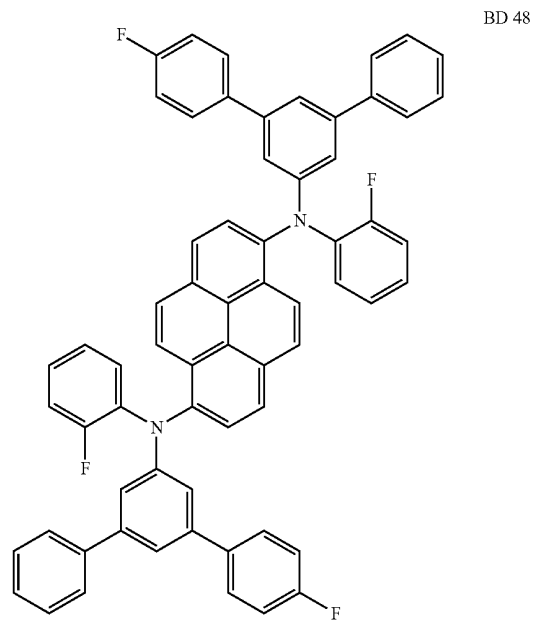
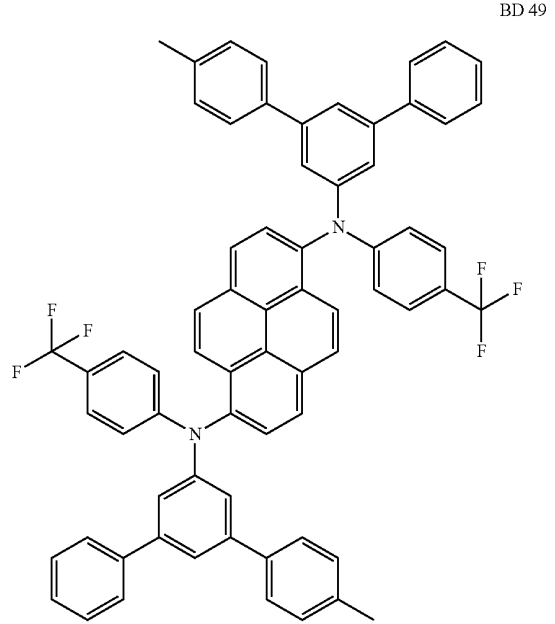
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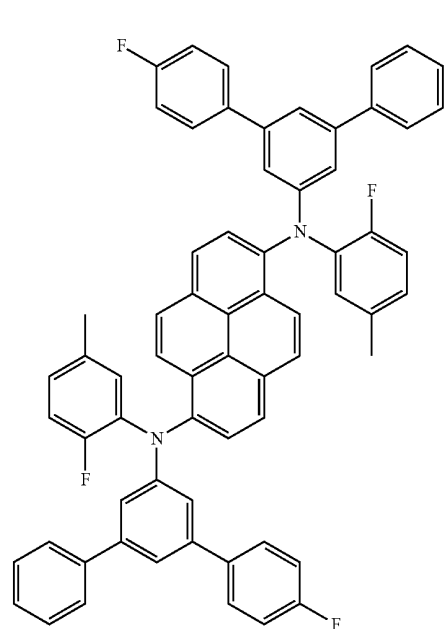
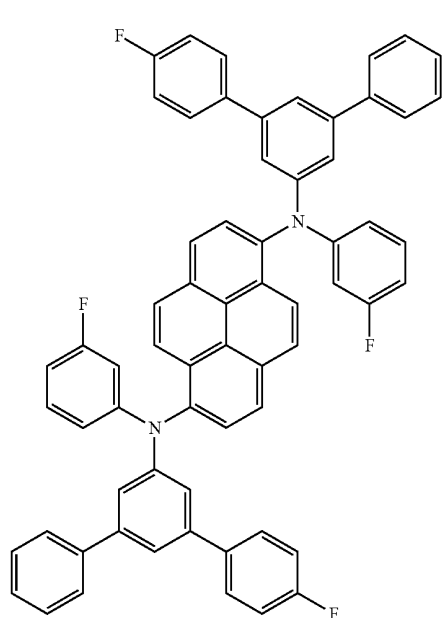
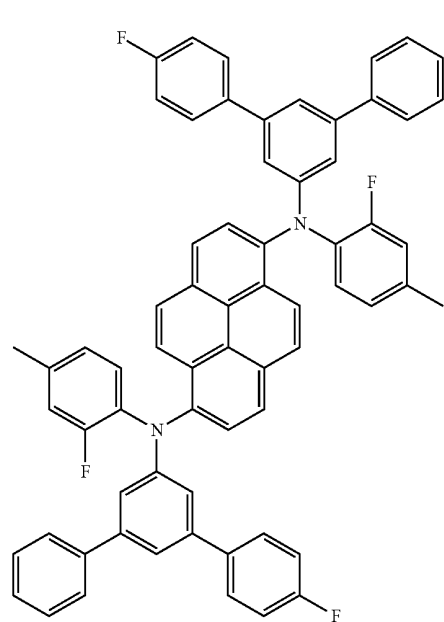
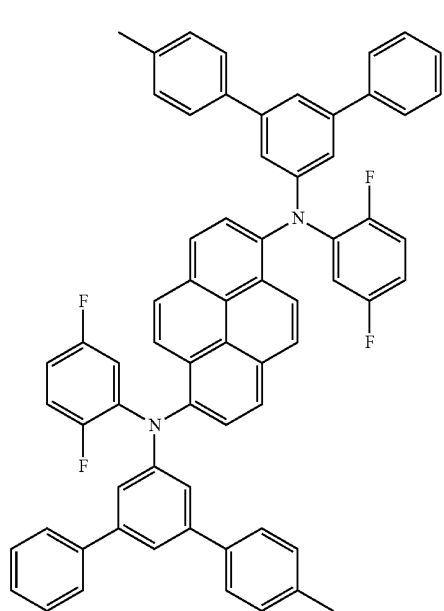


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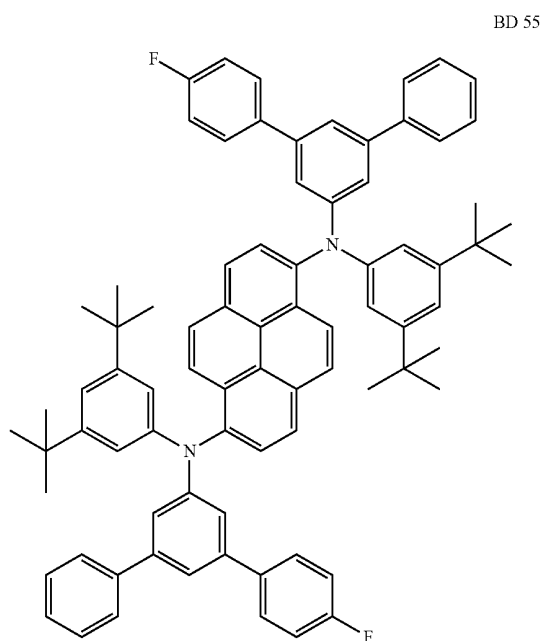


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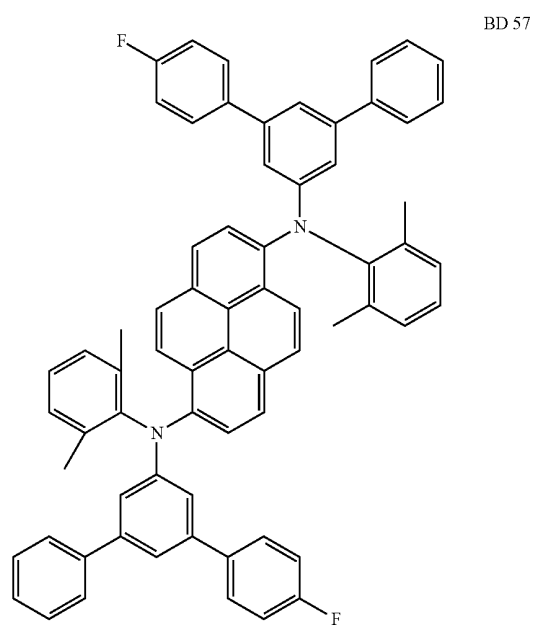
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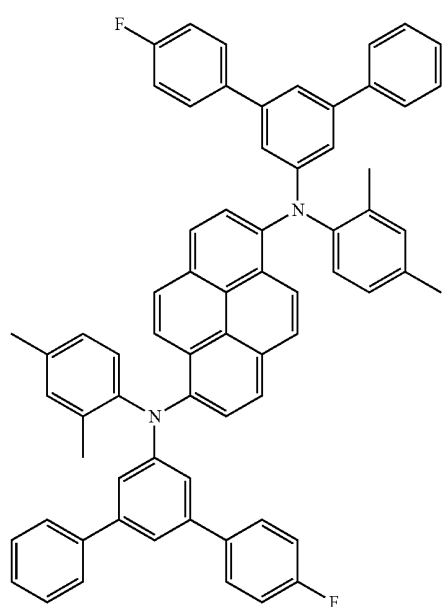
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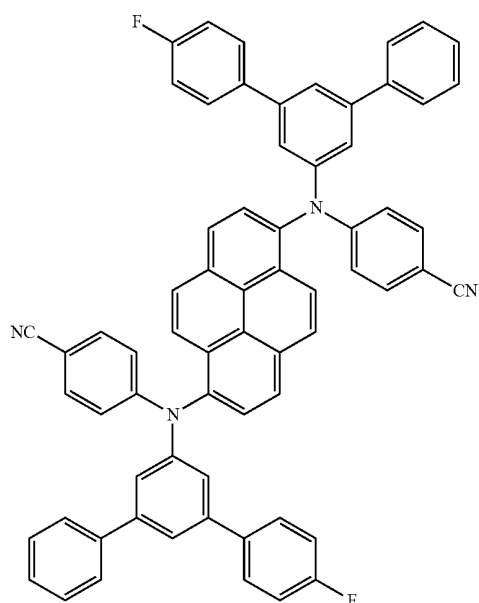
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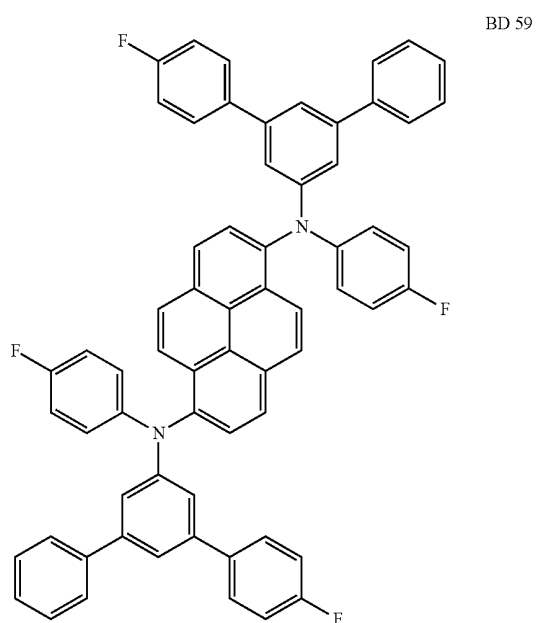
BD 56



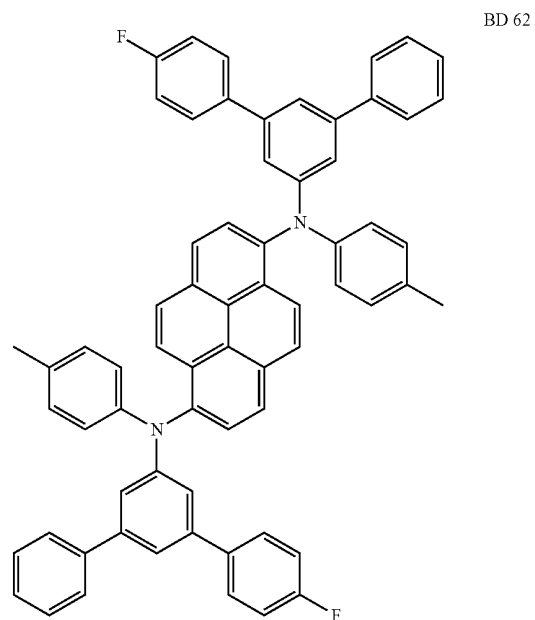
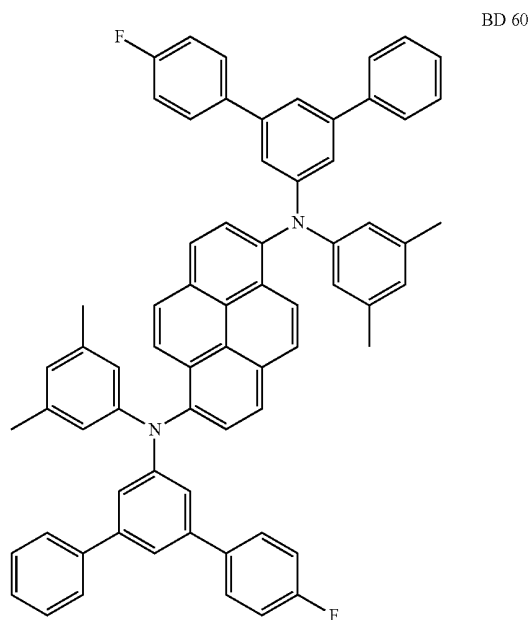
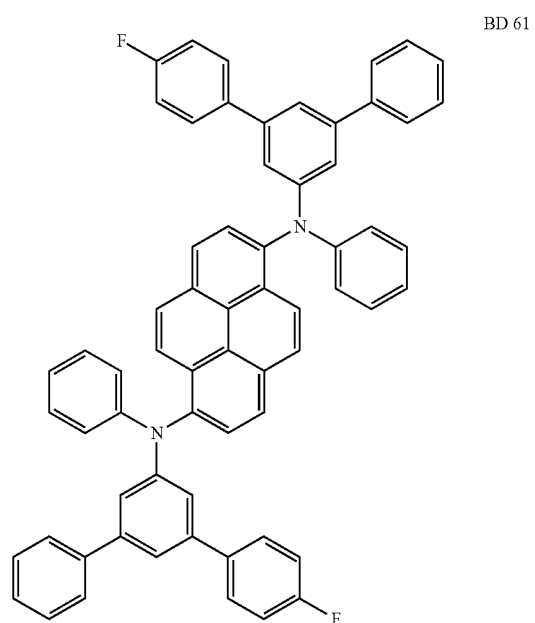
BD 58



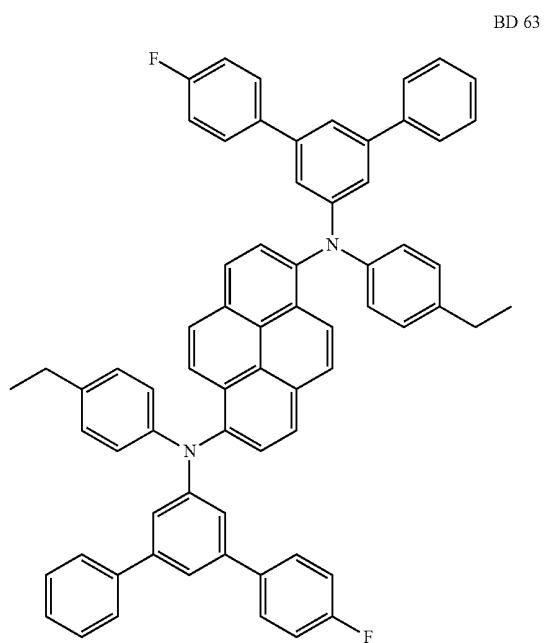
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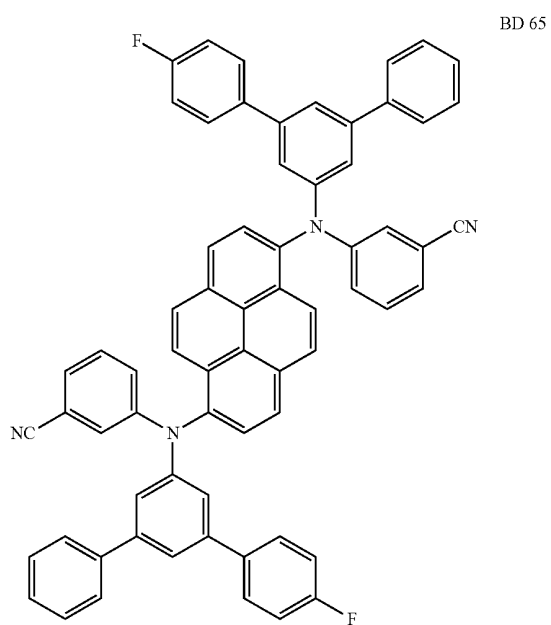
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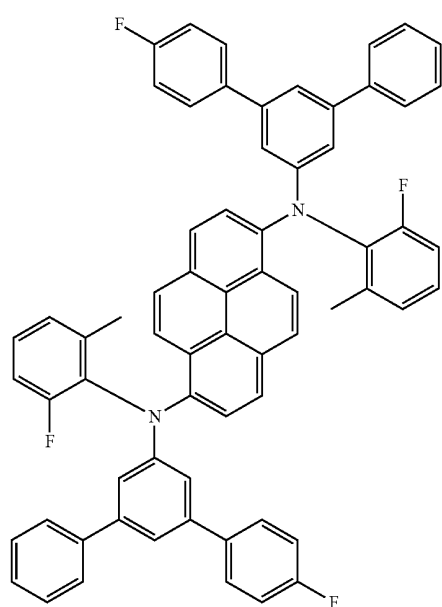
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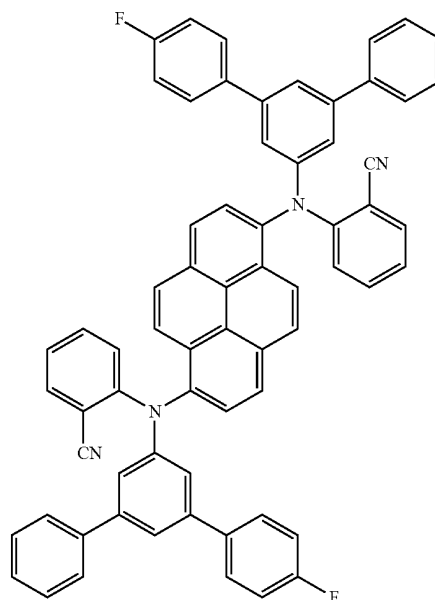
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BD 64

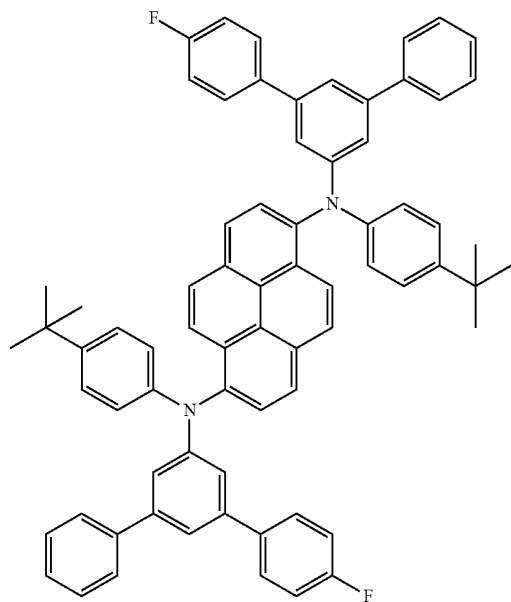


BD 66



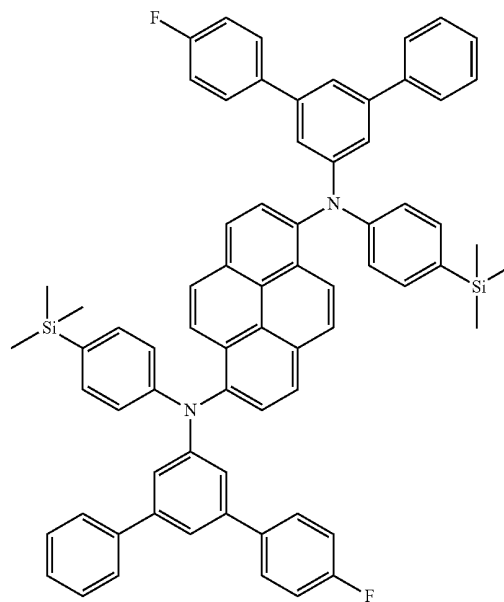
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BD 67

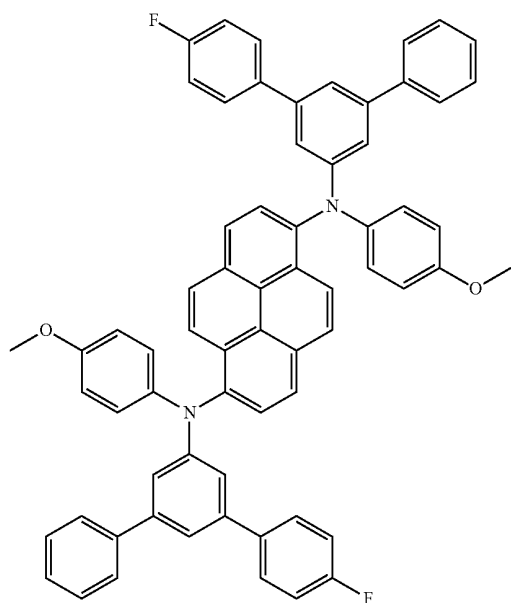


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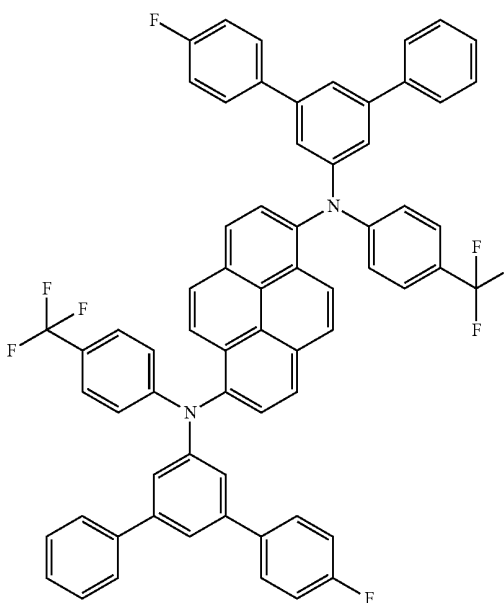
BD 69



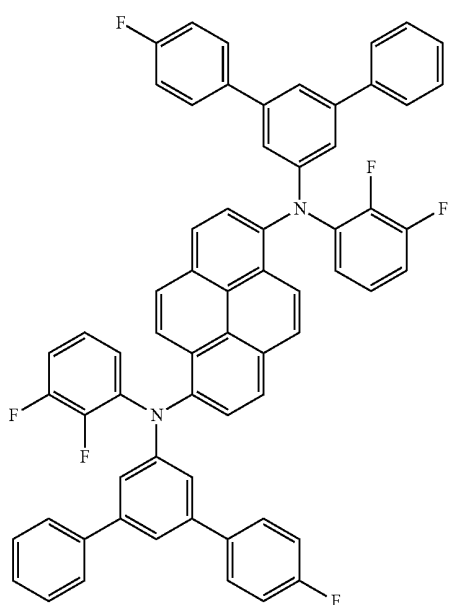
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BD 70

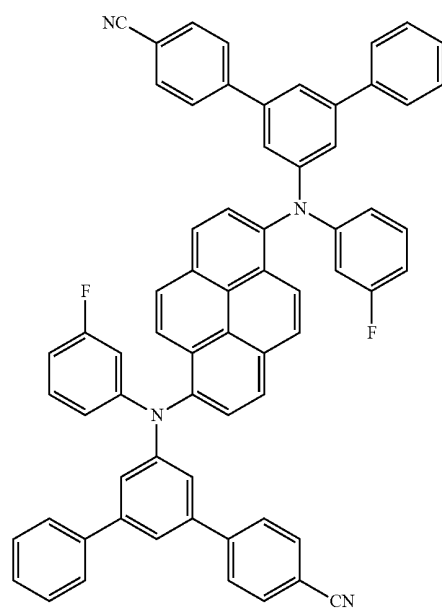


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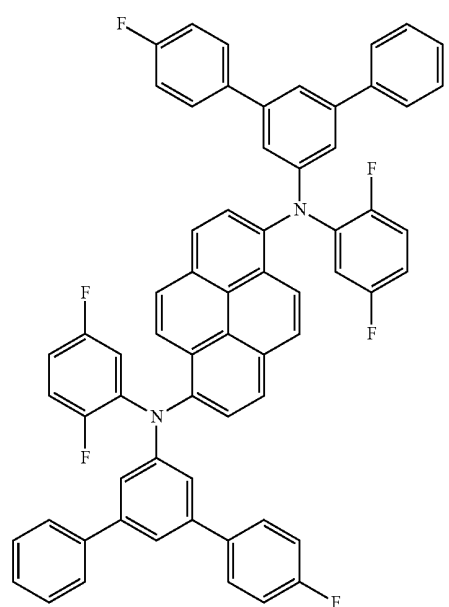


BD 71

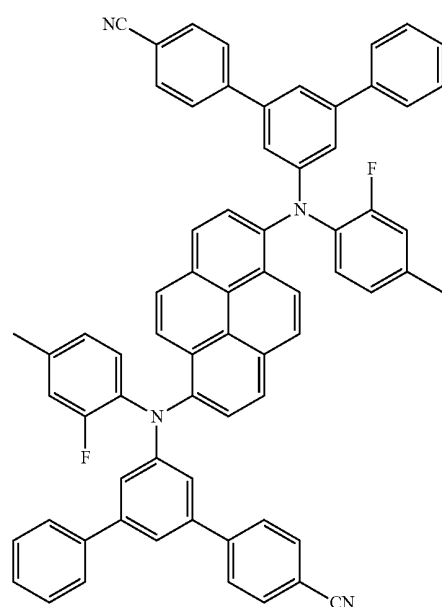
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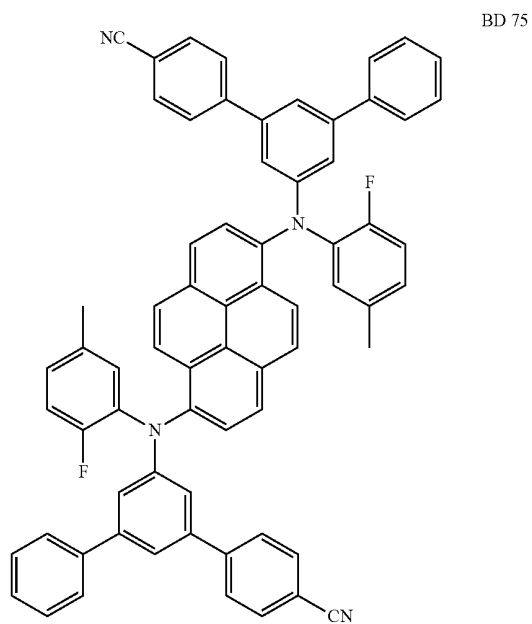


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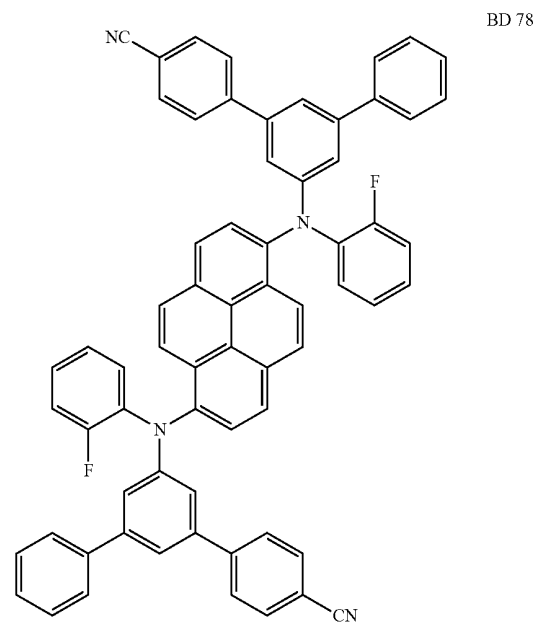
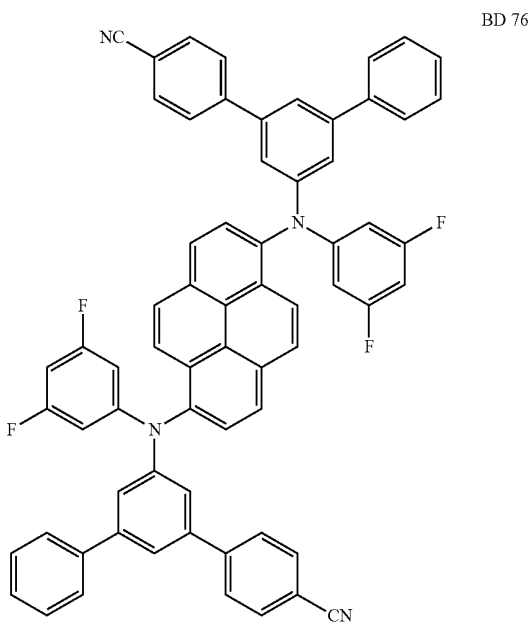
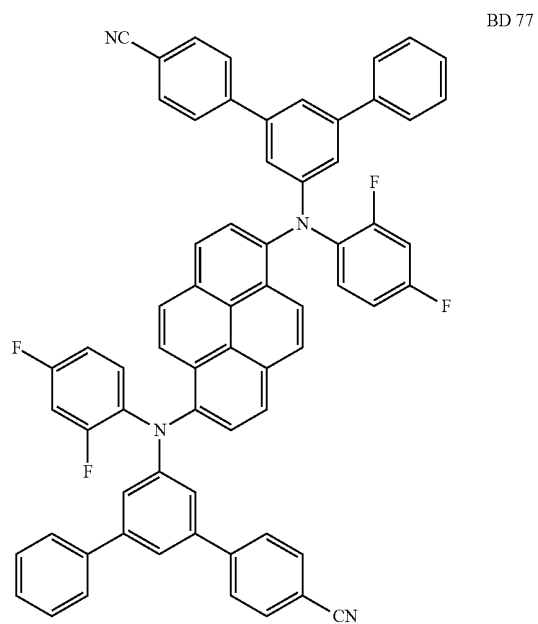


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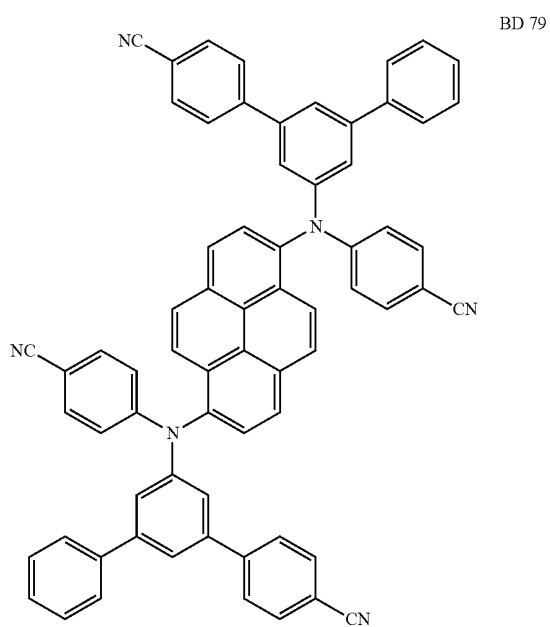
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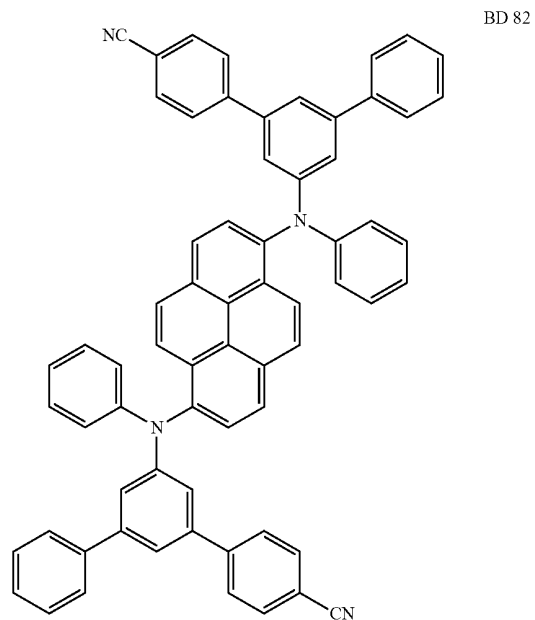
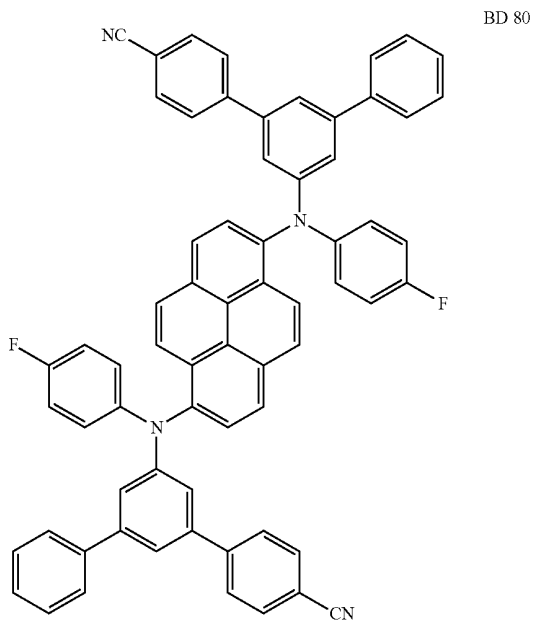
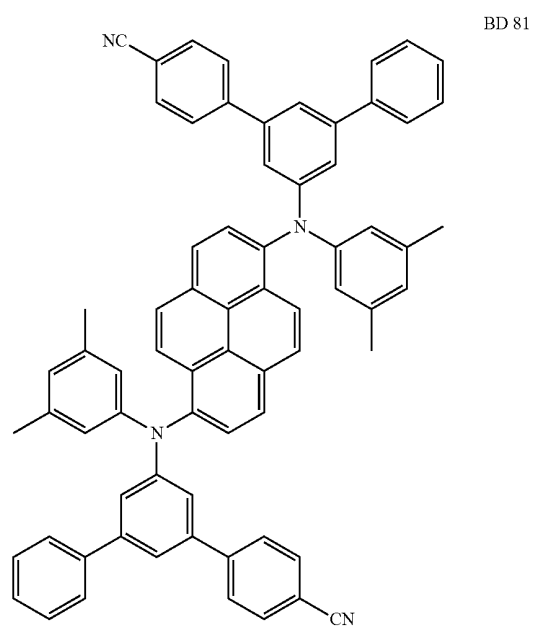
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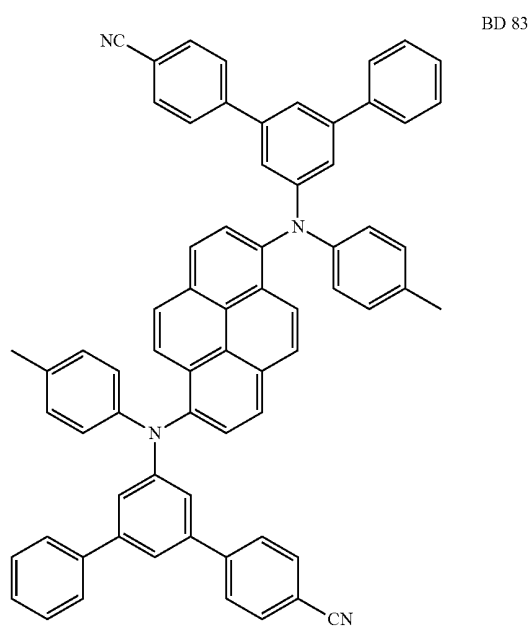
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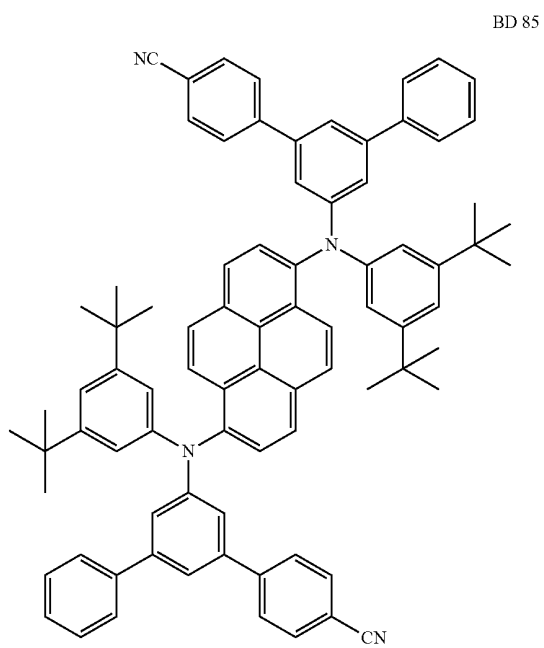
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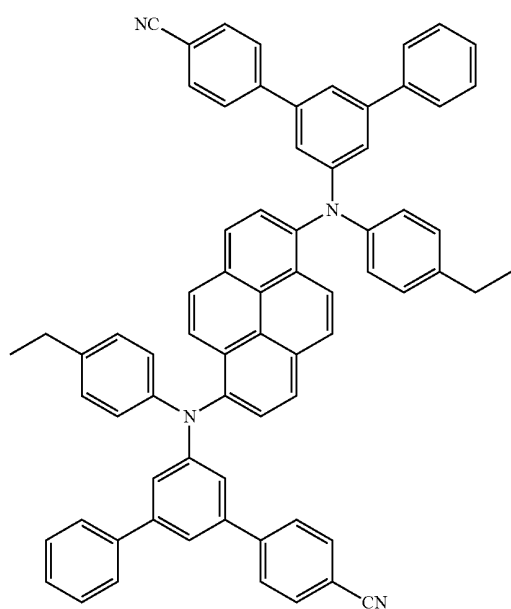
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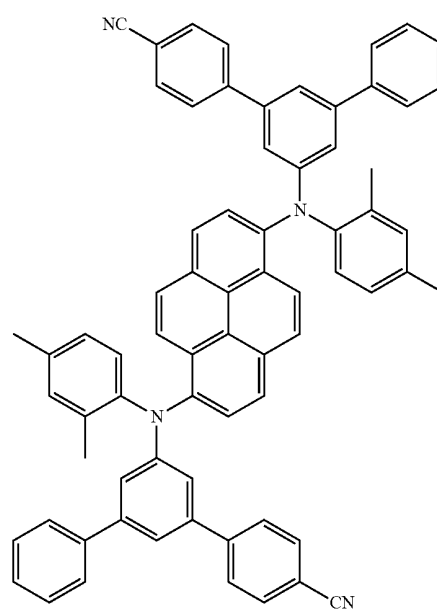
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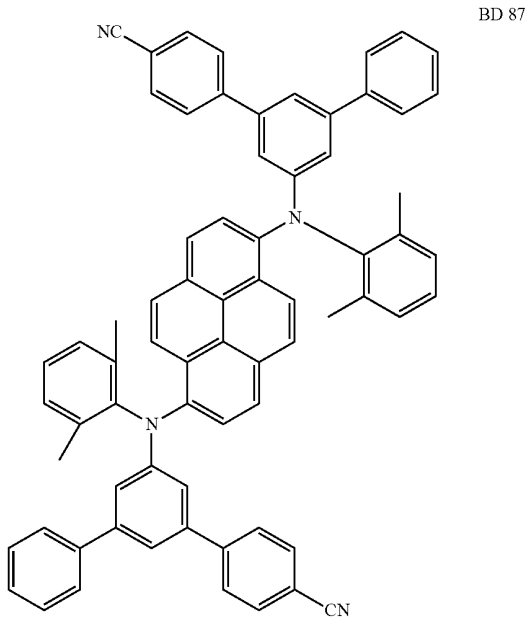
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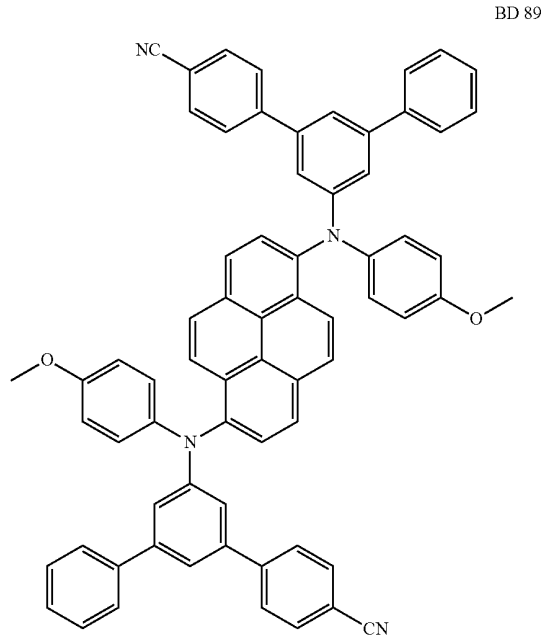
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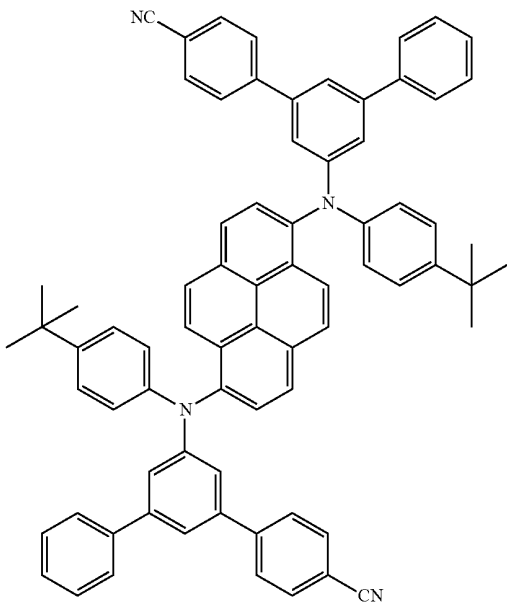
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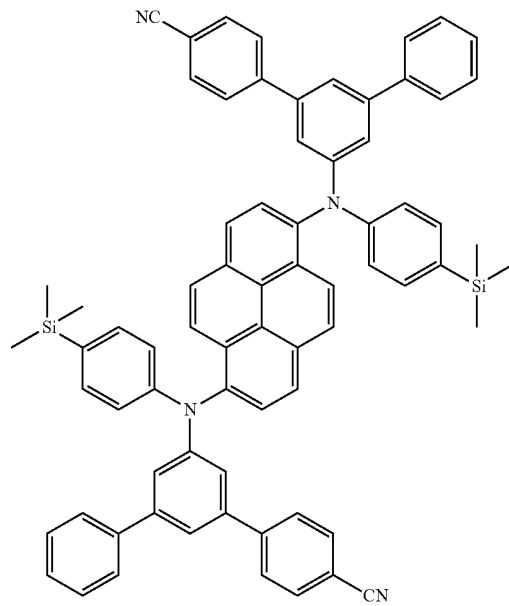
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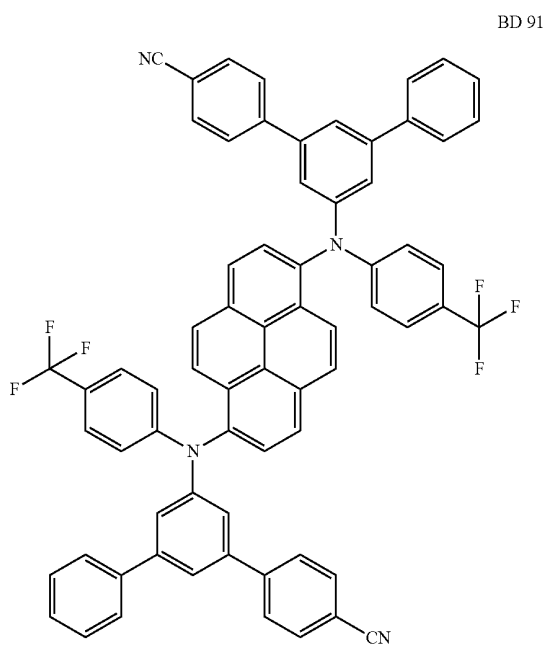
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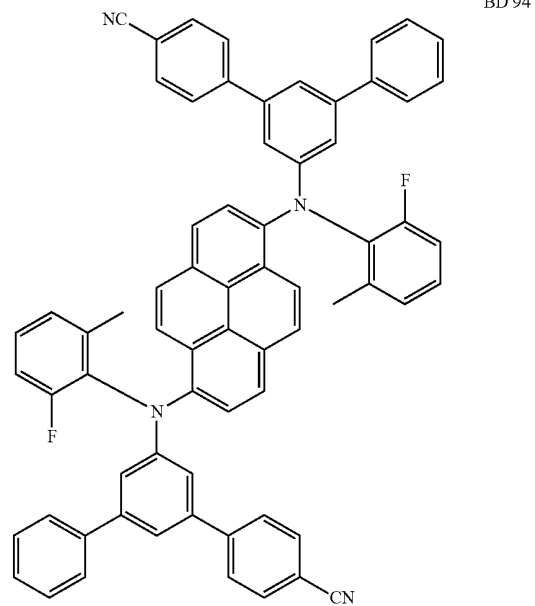
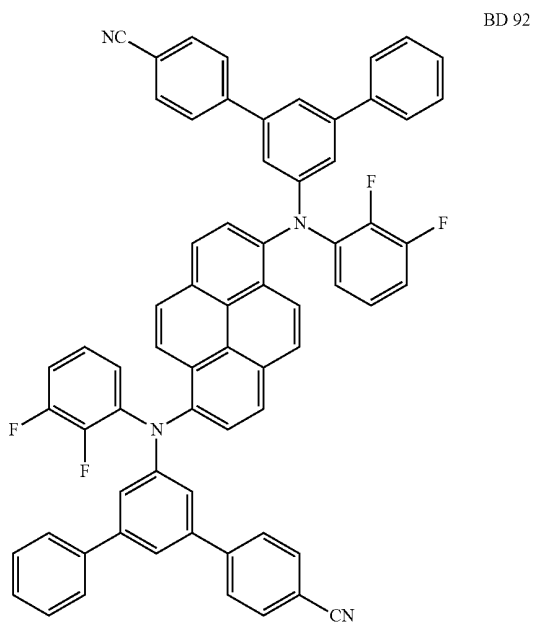
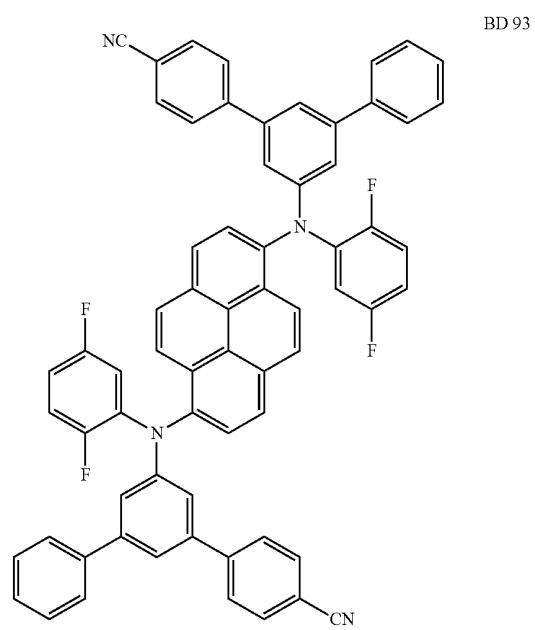
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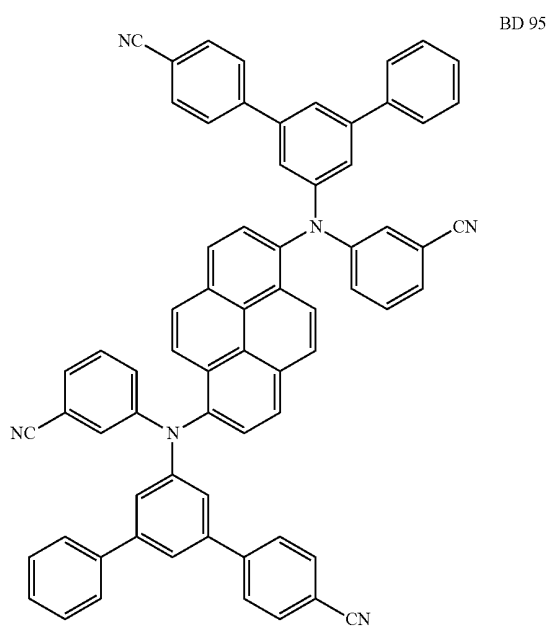
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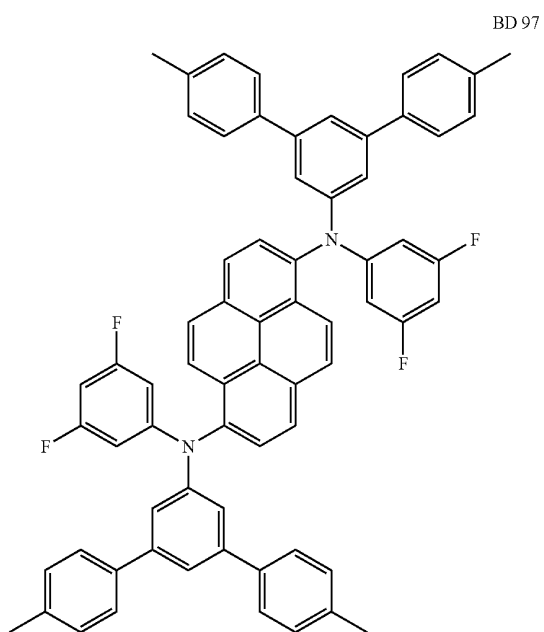
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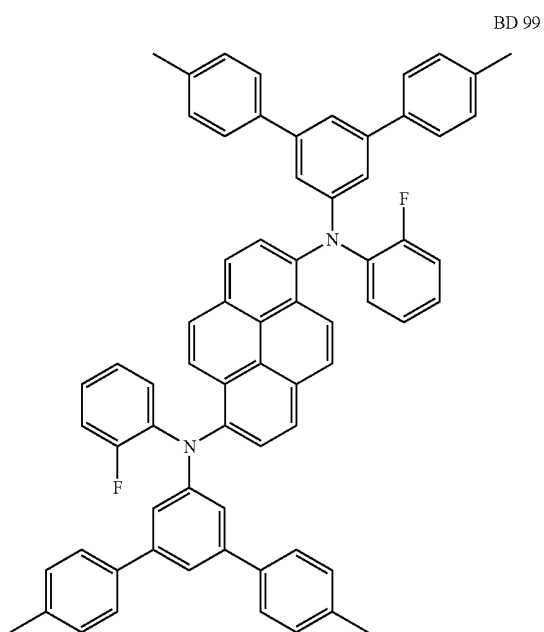
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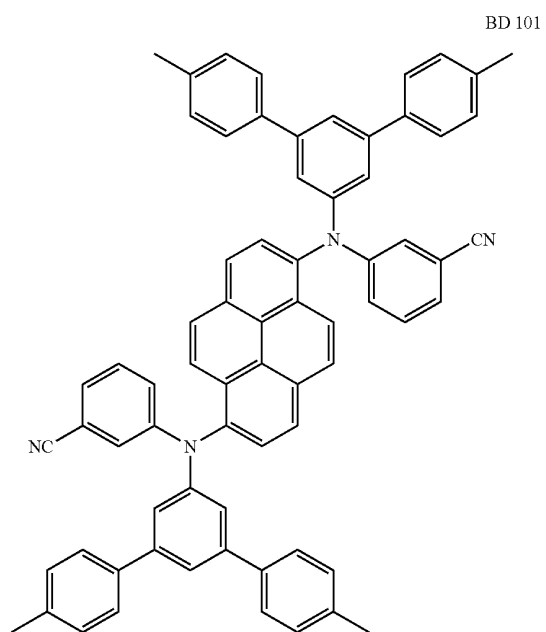
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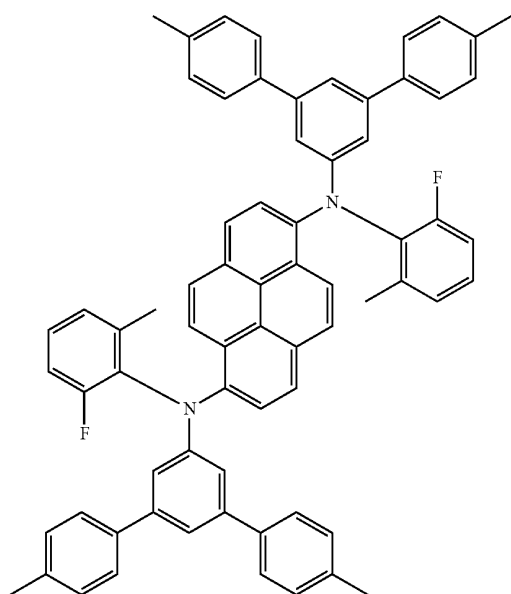
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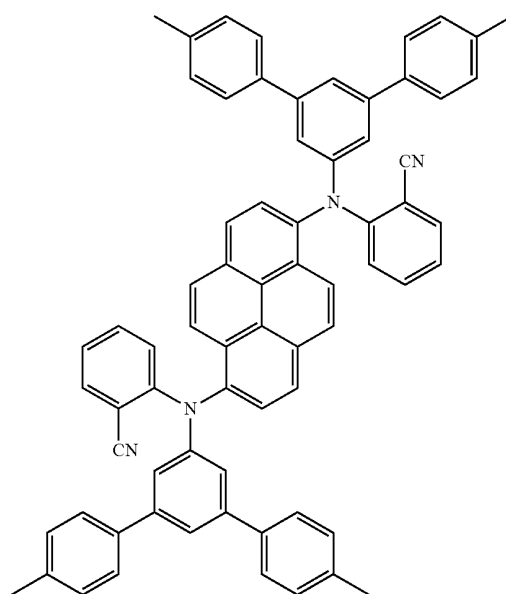
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BD 100

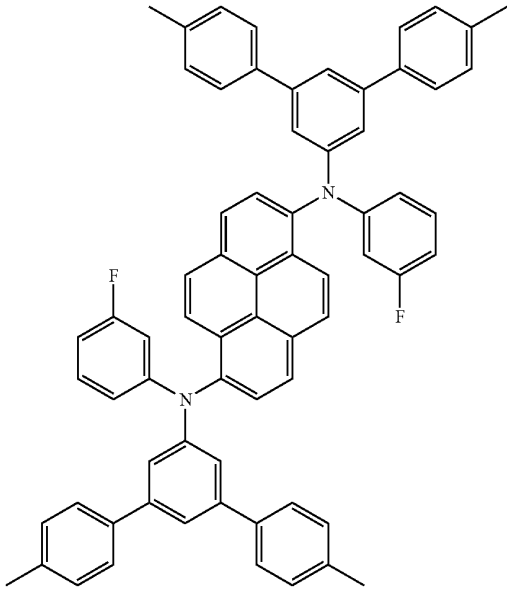


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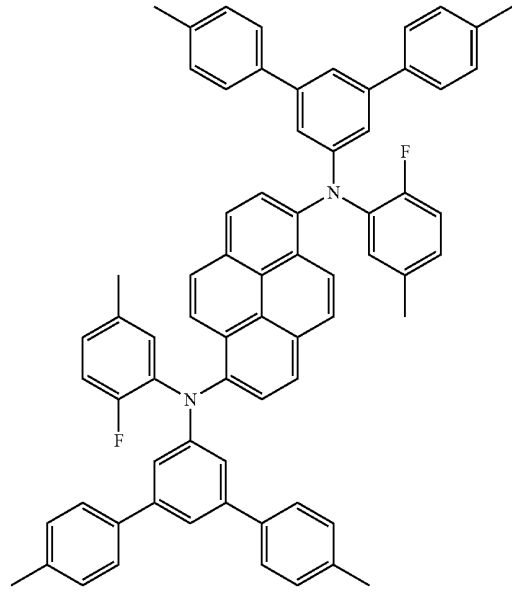
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BD 103

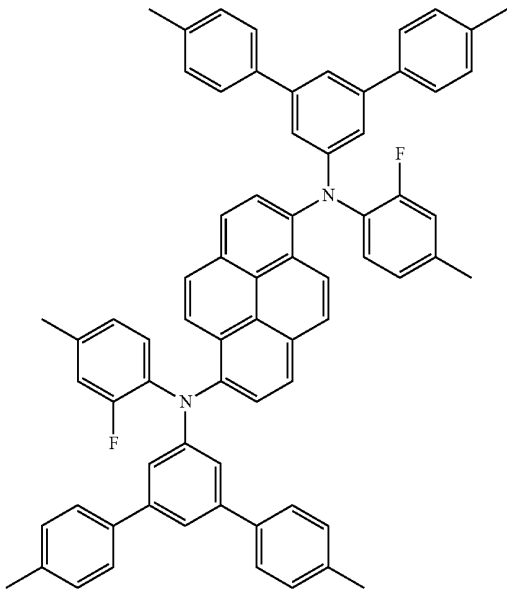


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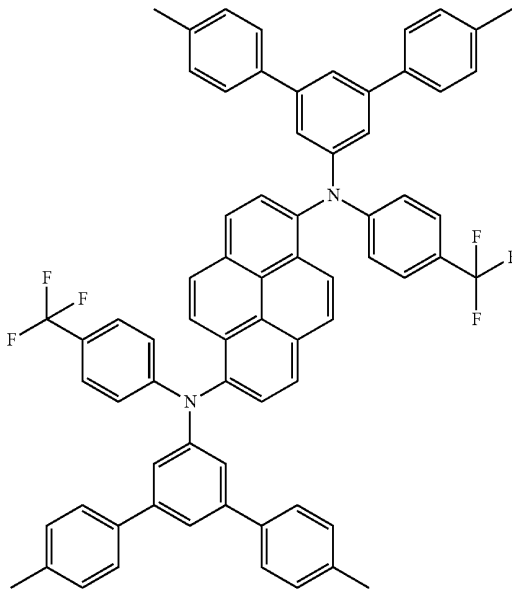
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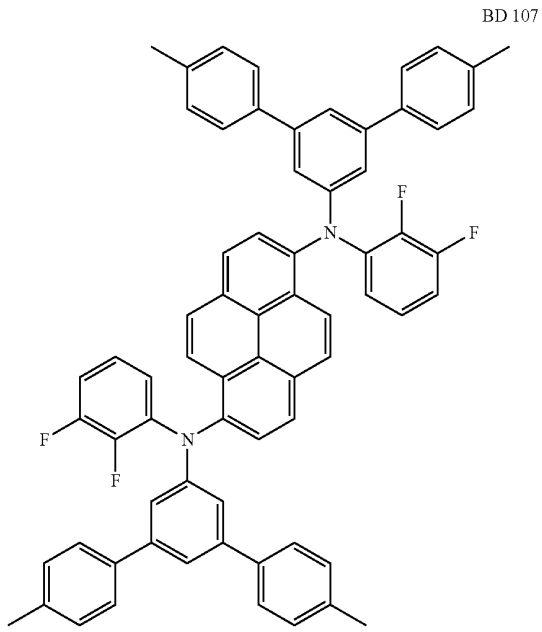
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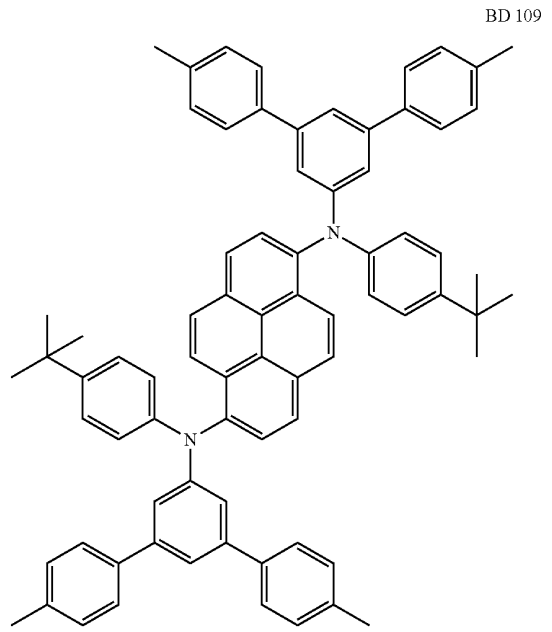
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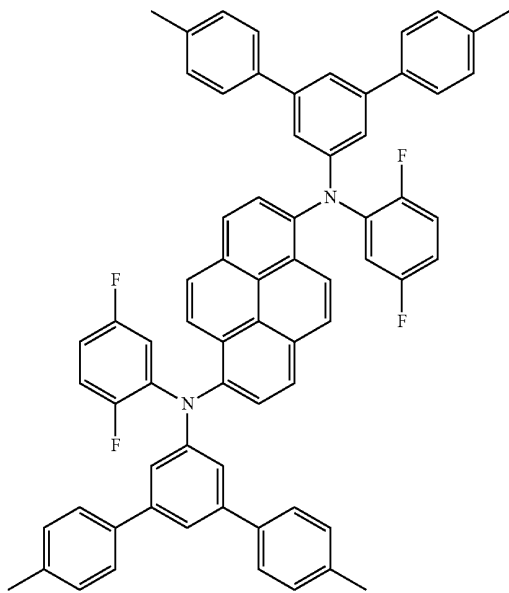
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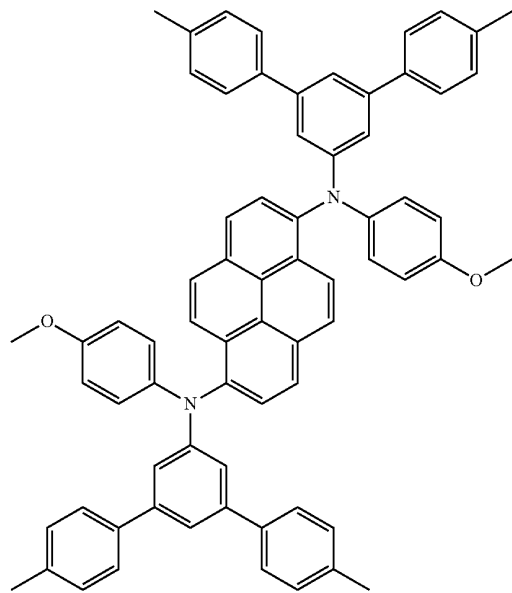
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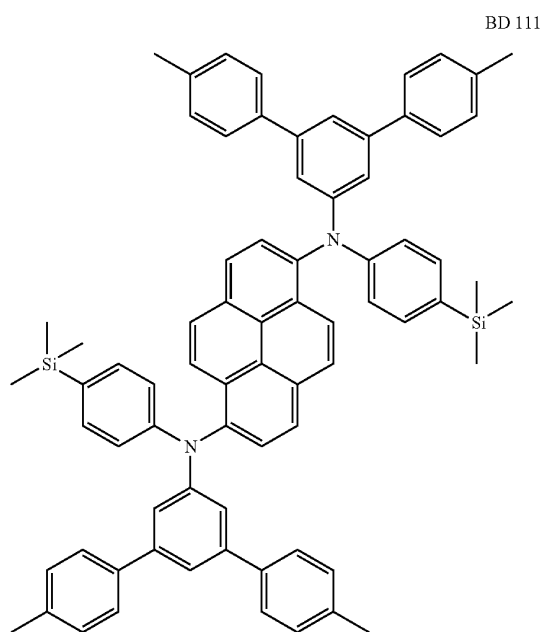
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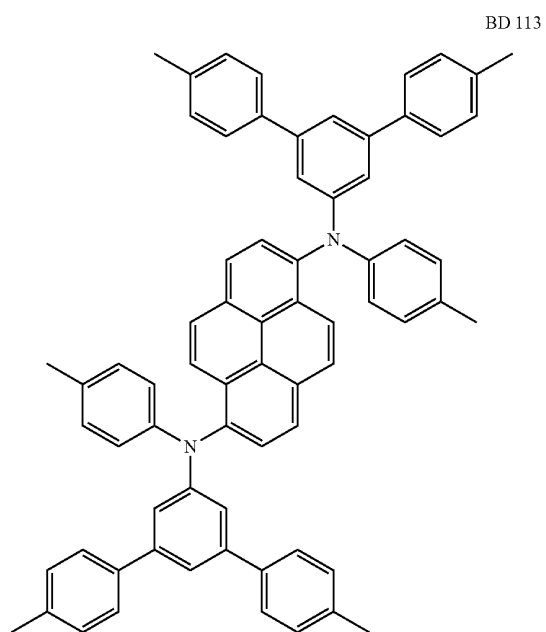
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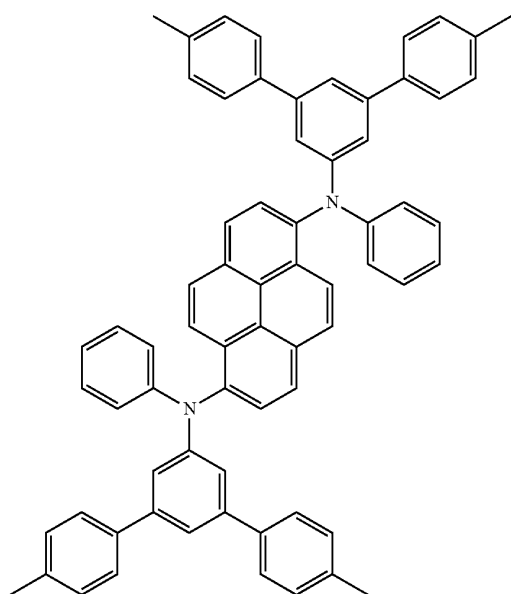
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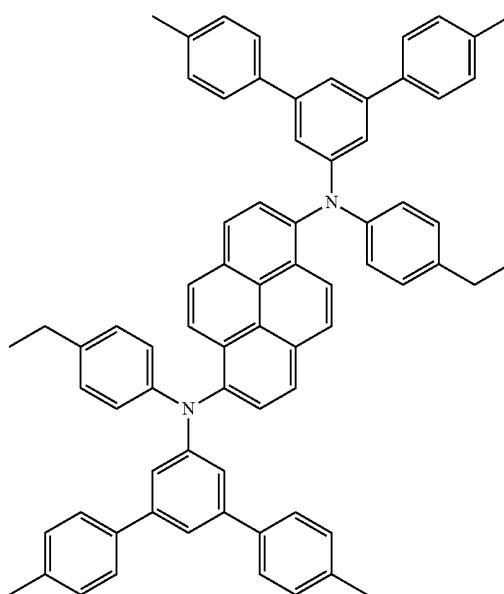
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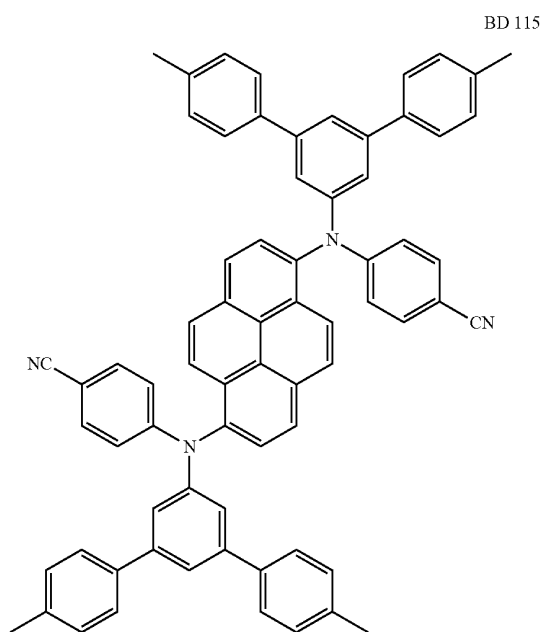
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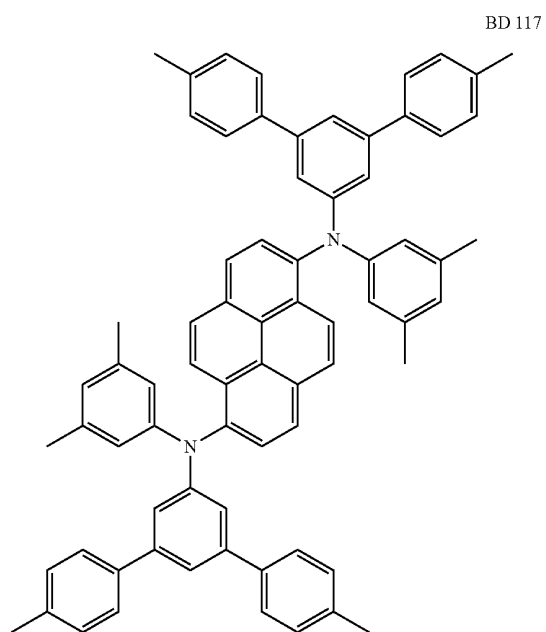
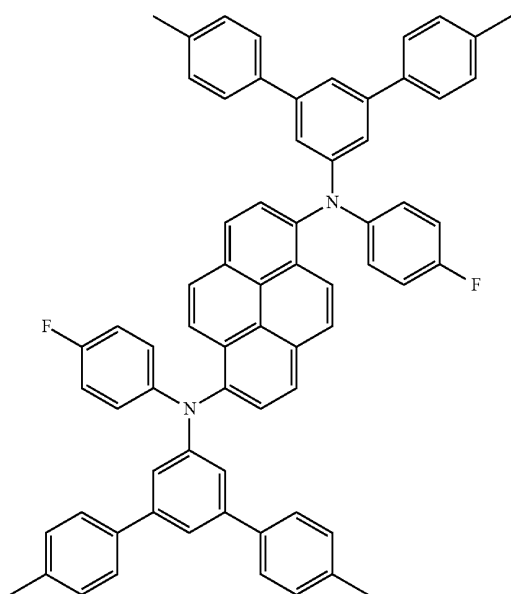
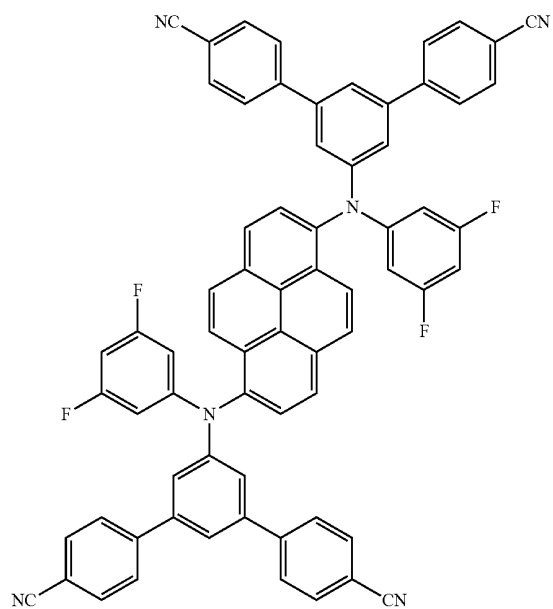
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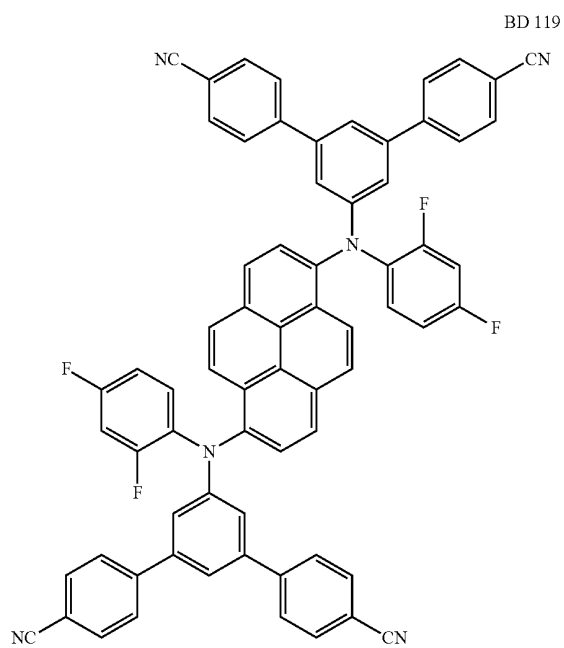
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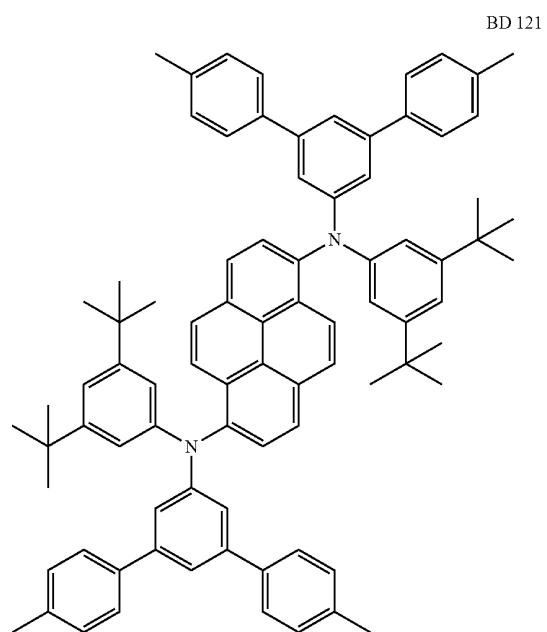
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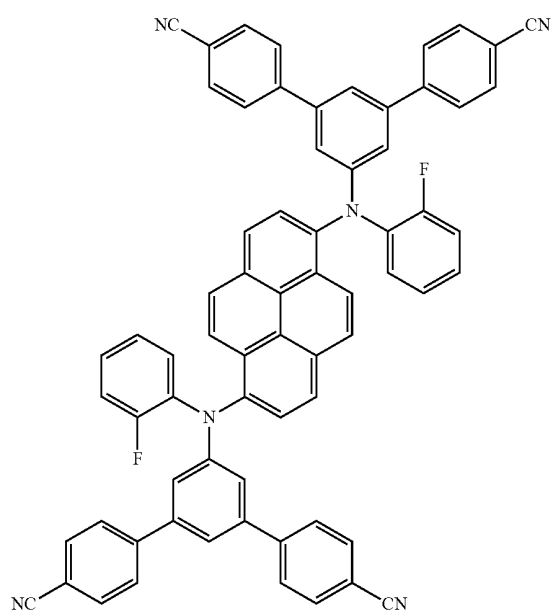
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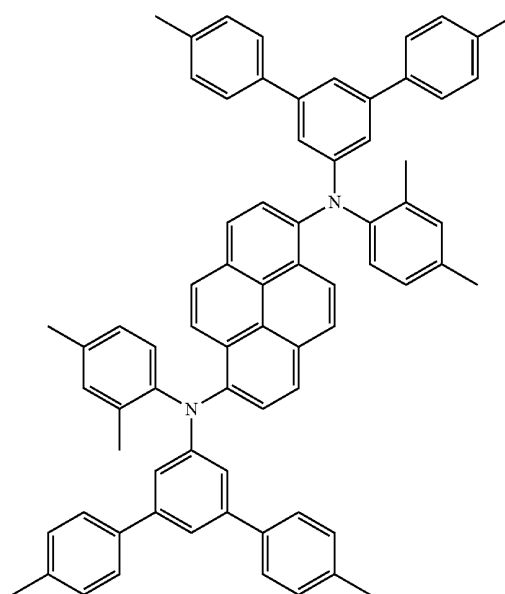
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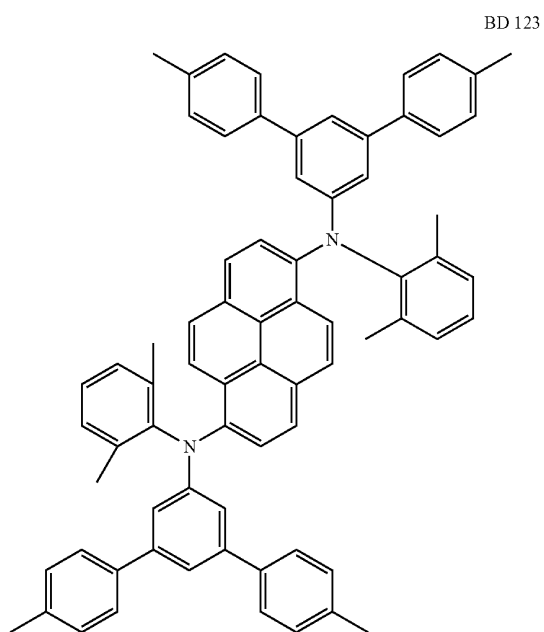
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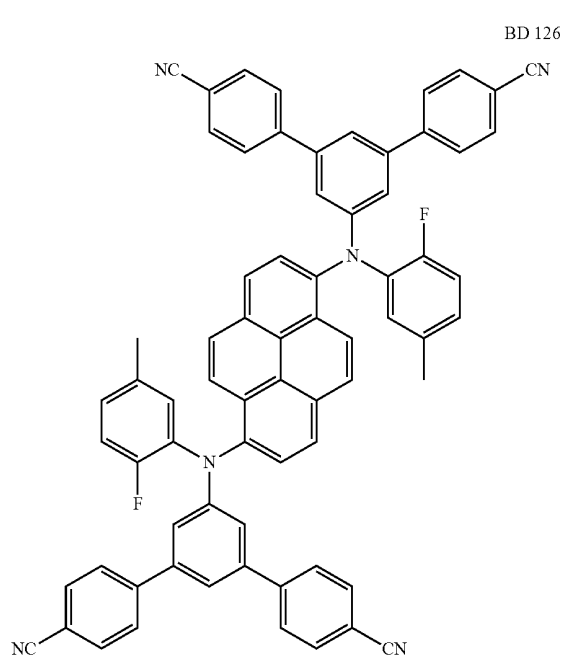
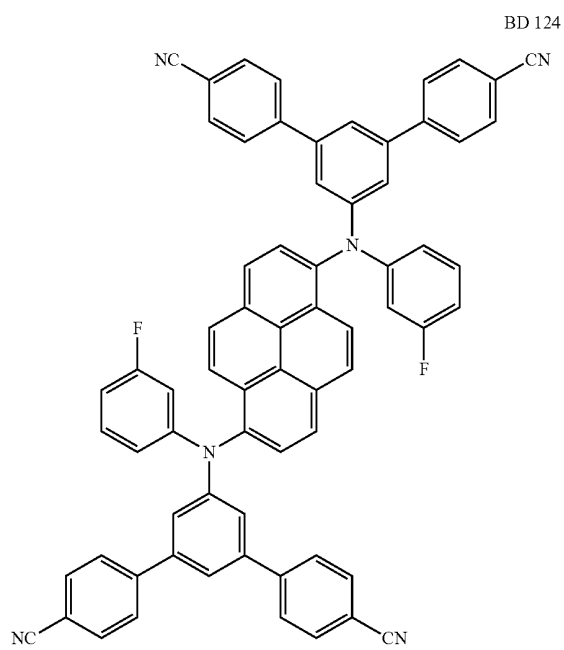
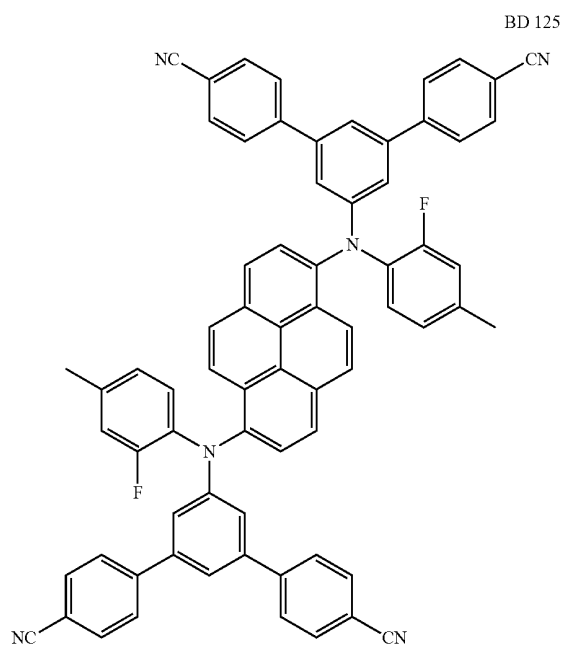
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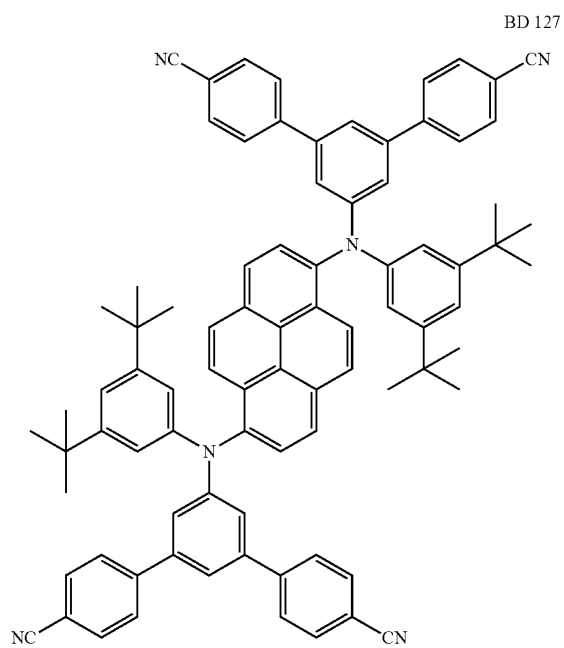
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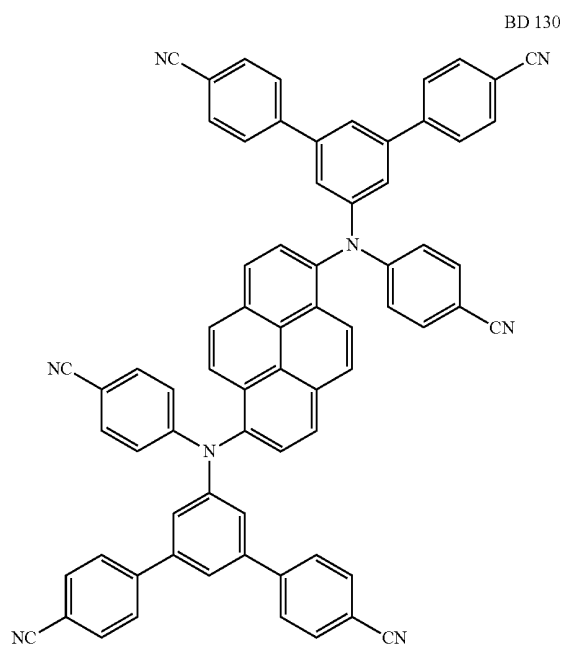
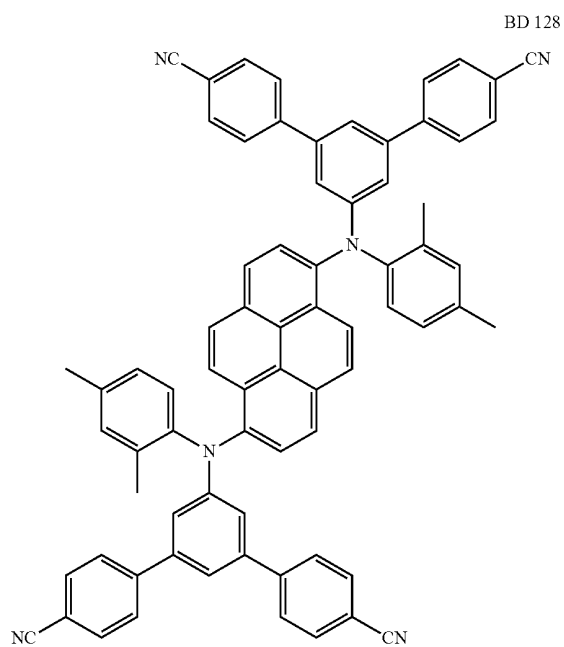
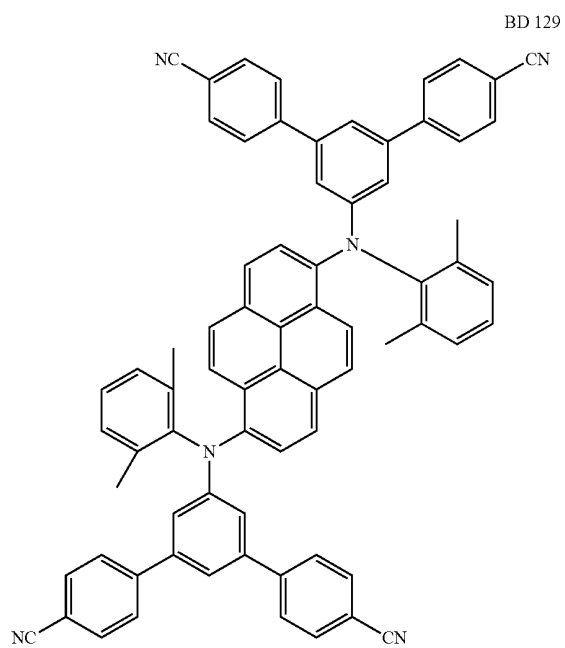
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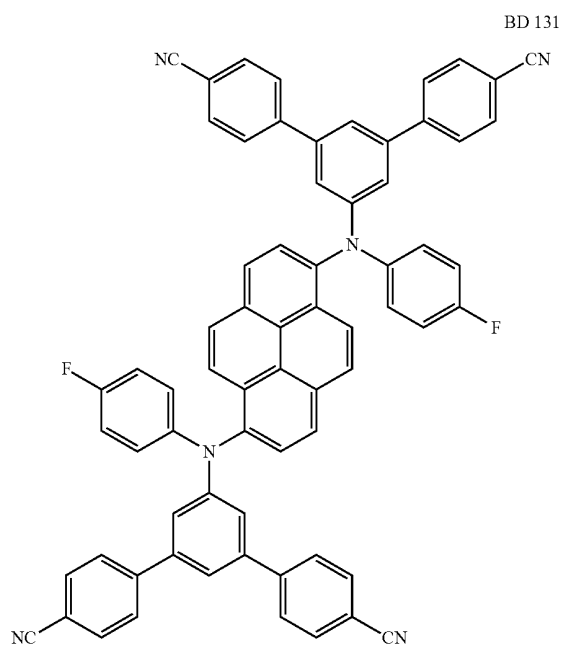
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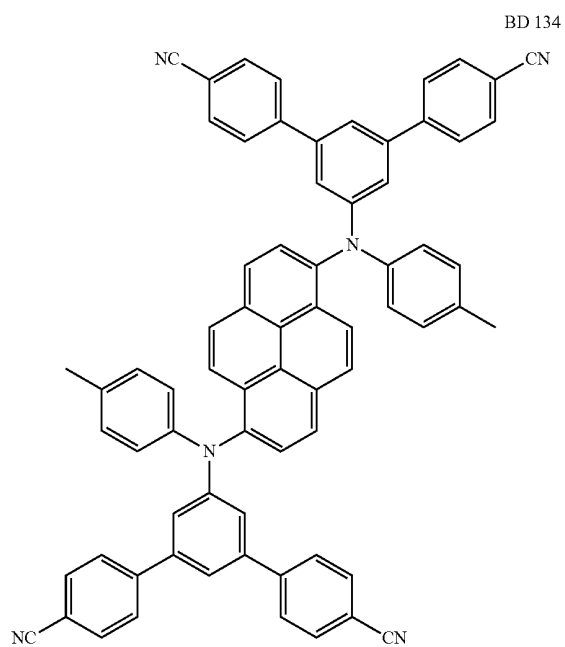
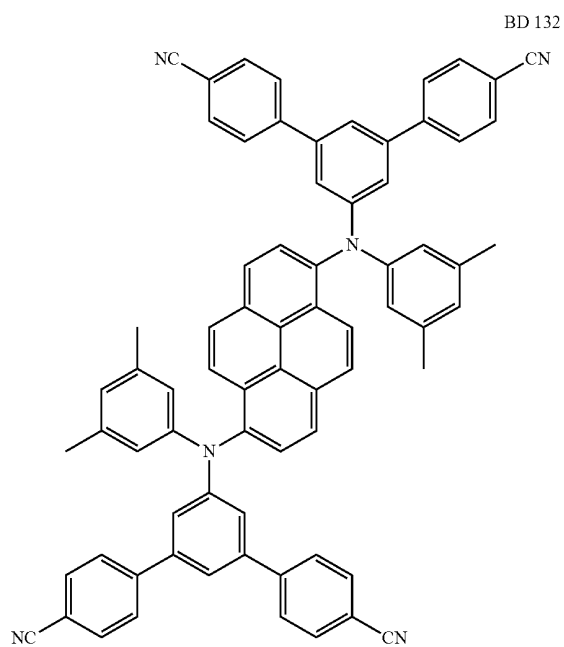
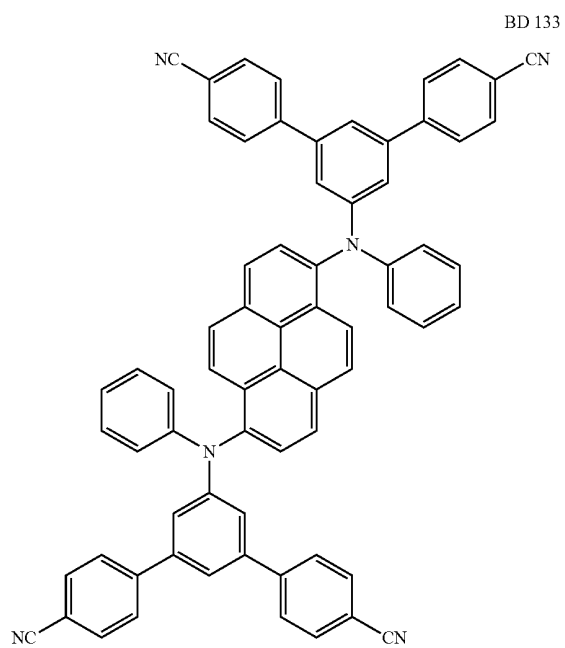
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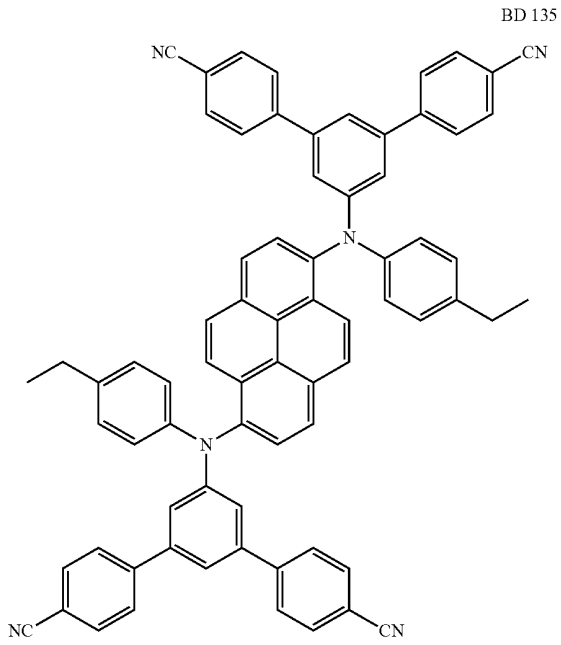
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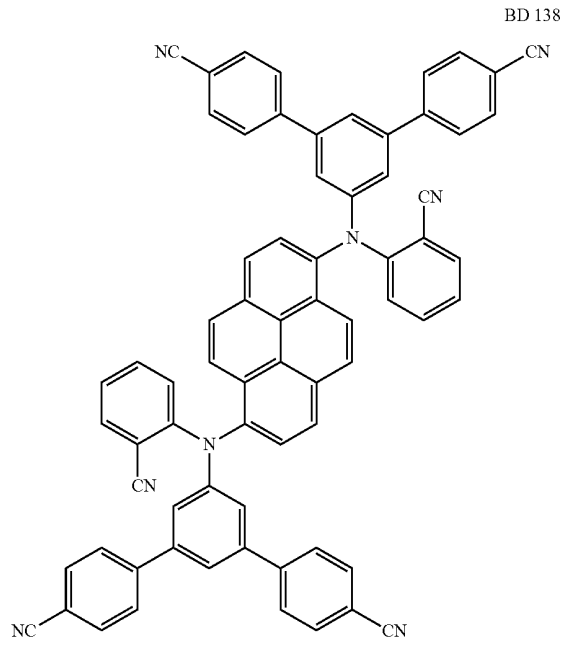
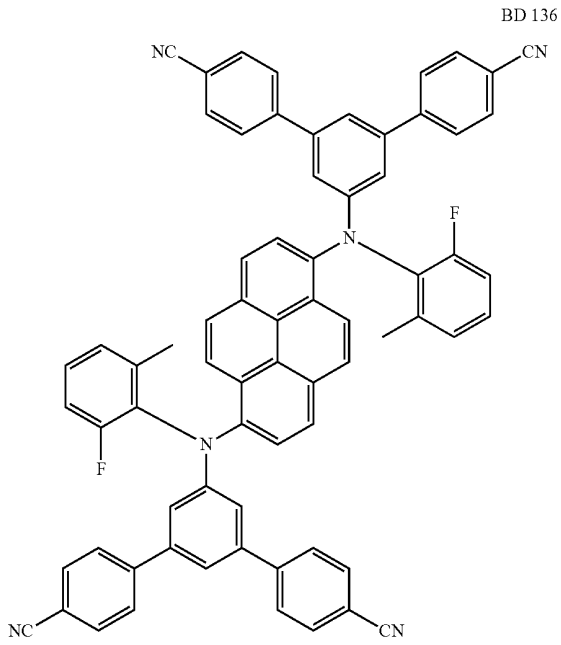
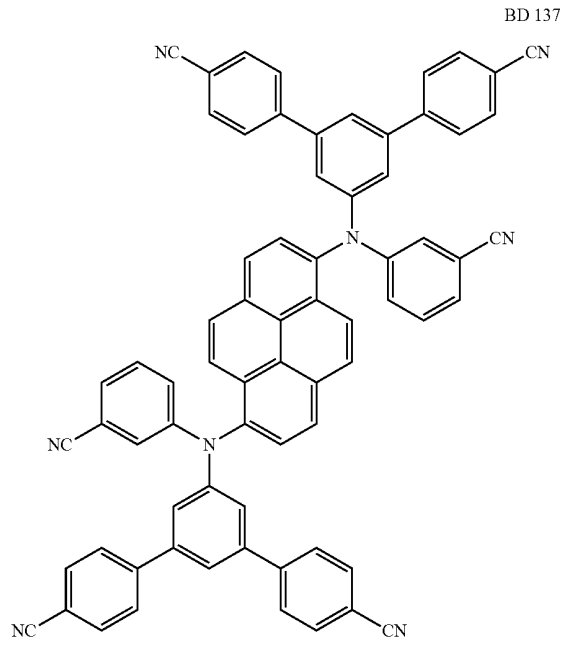
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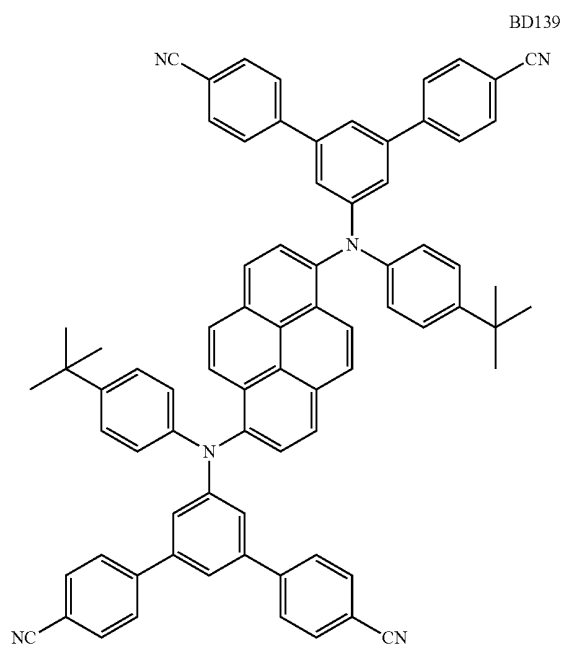
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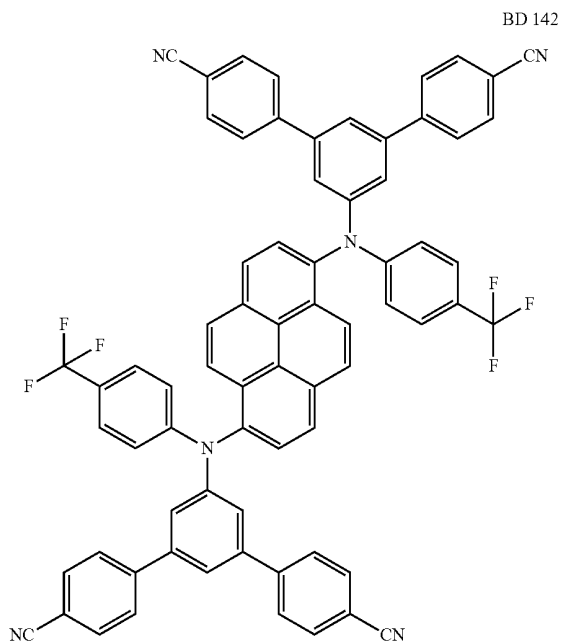
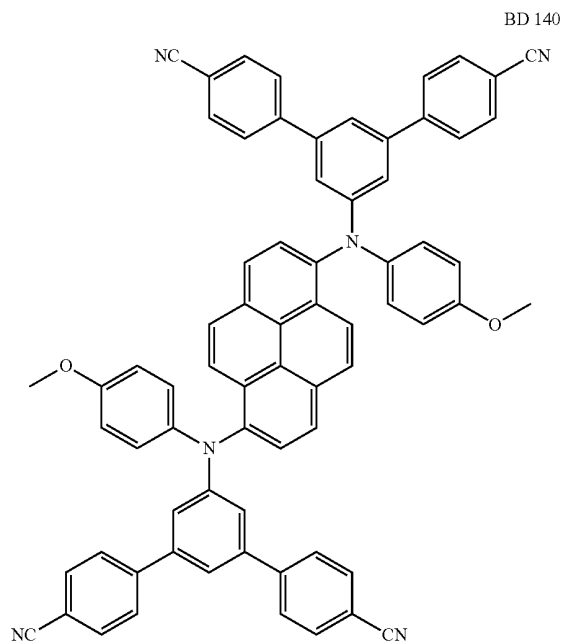
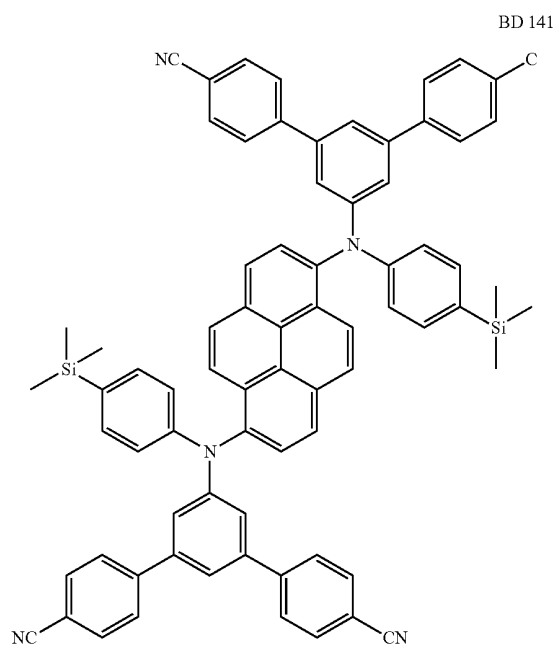
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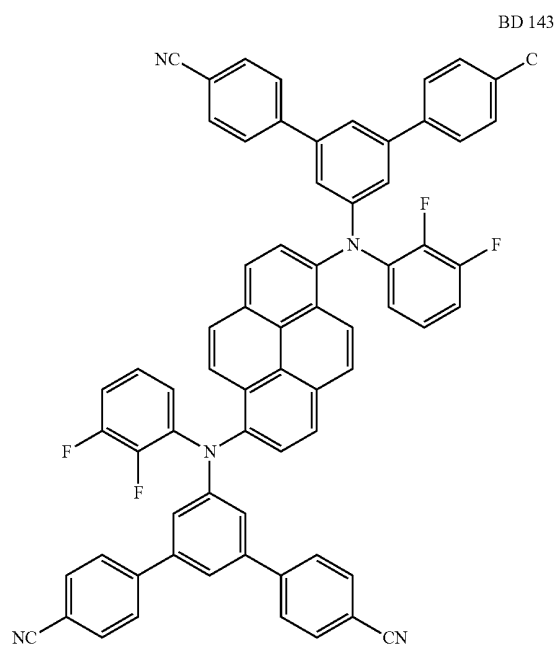
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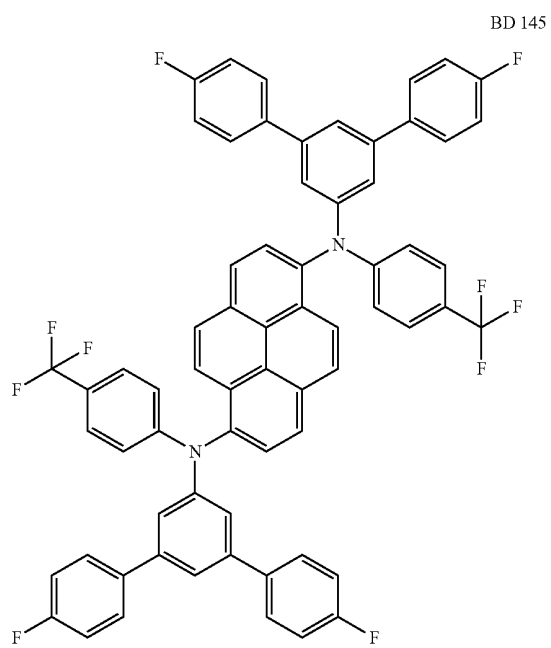
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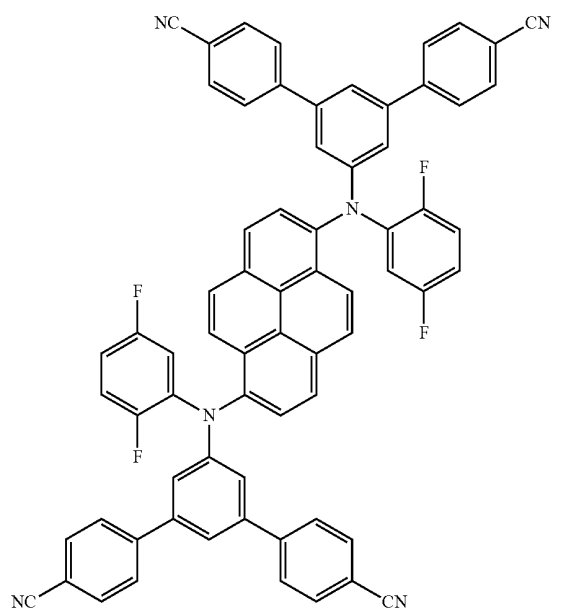
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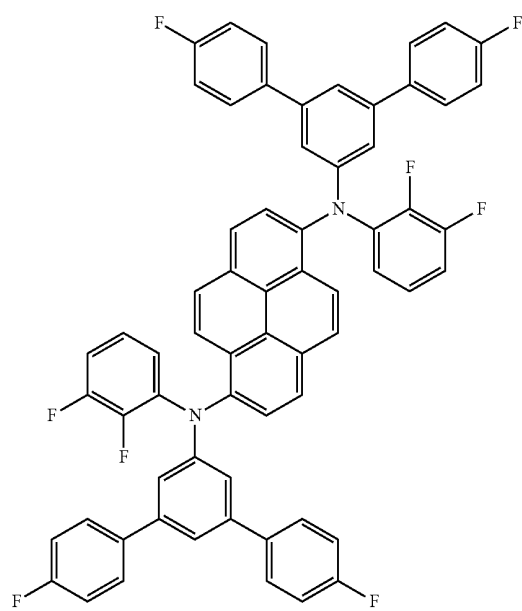
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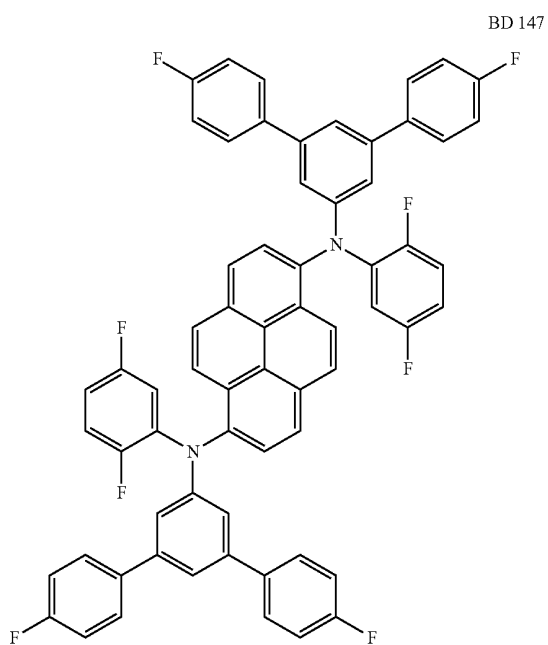
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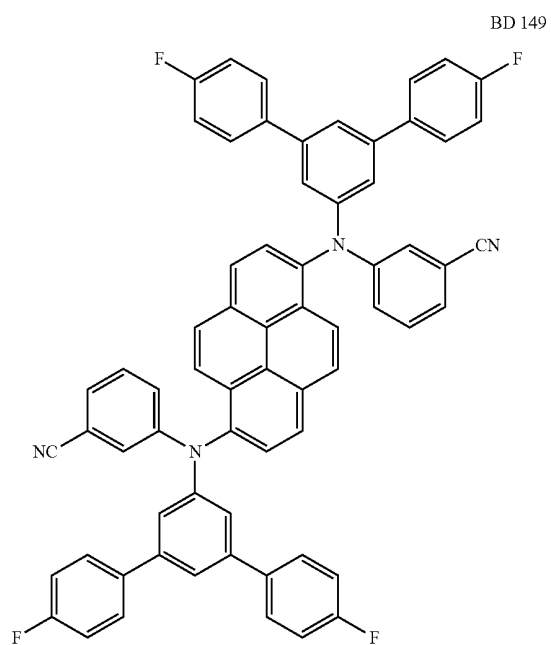
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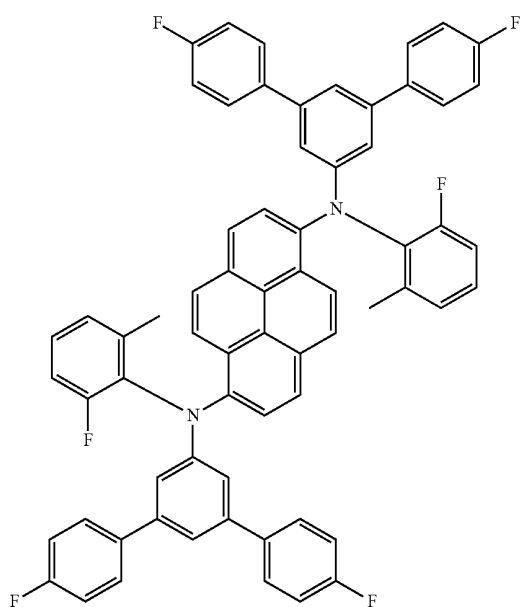
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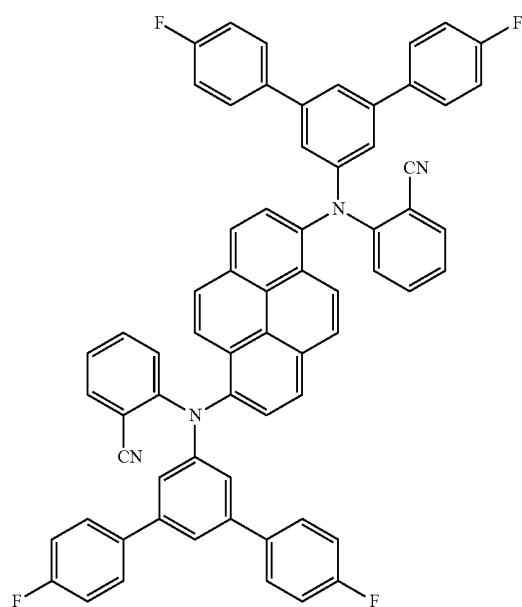
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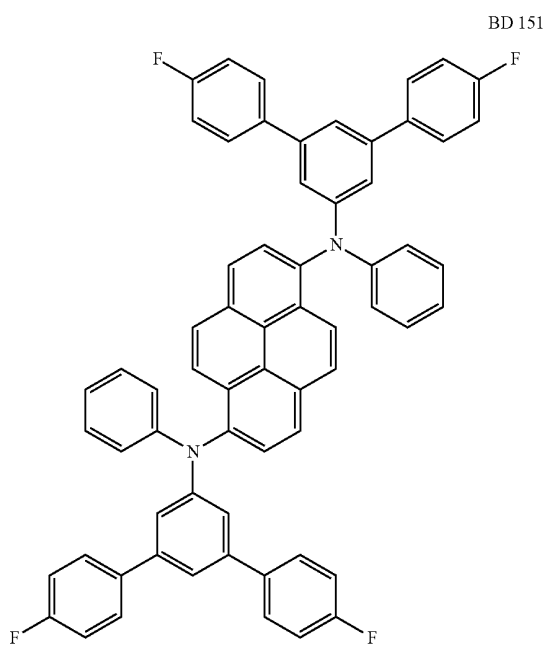
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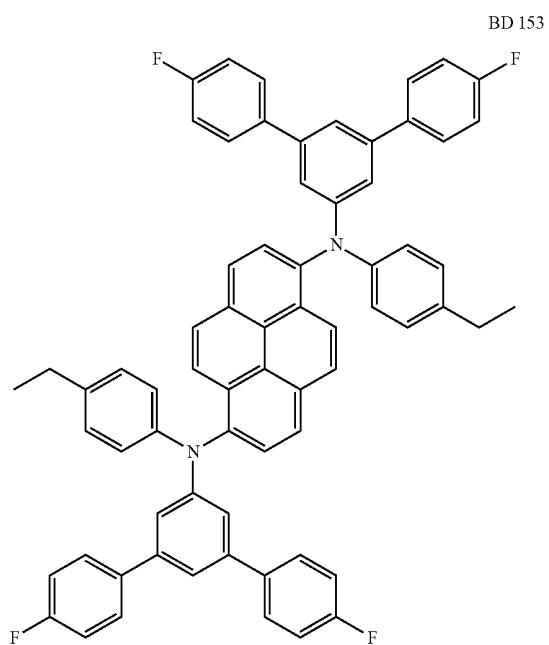
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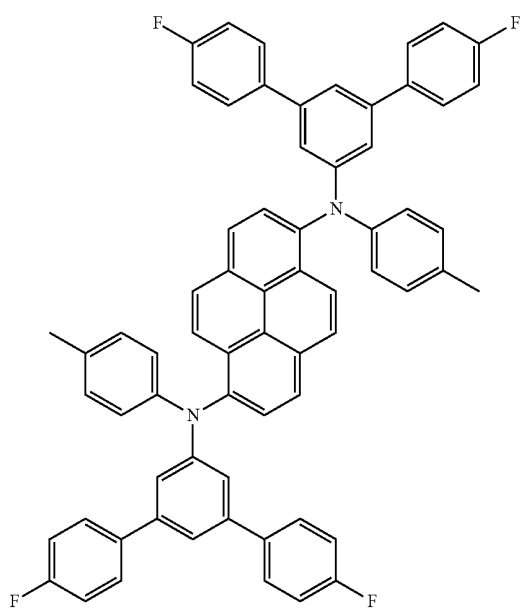
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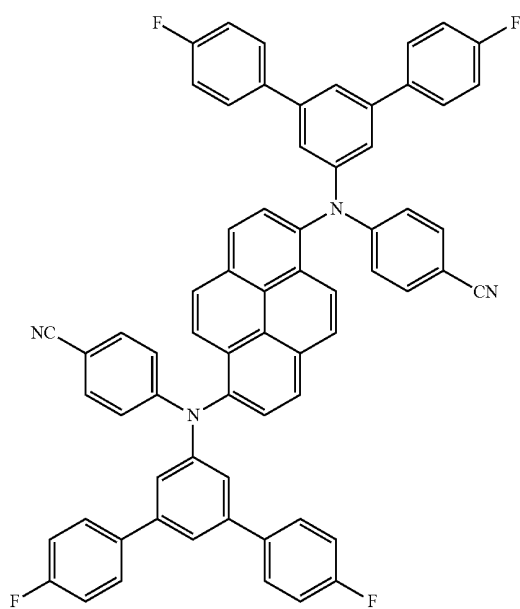
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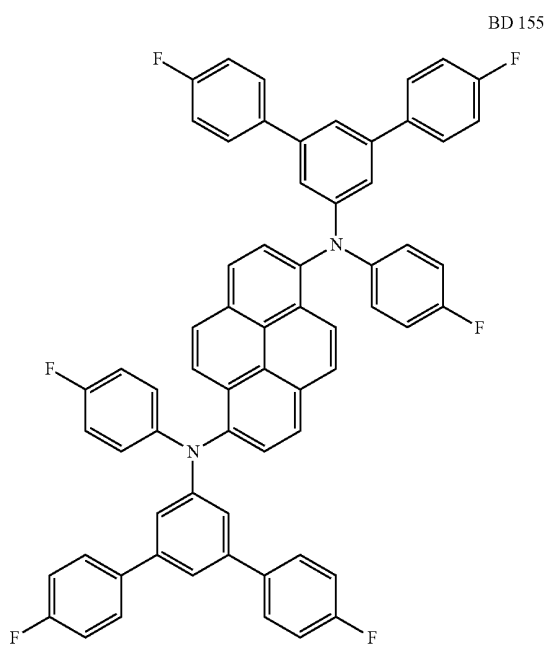
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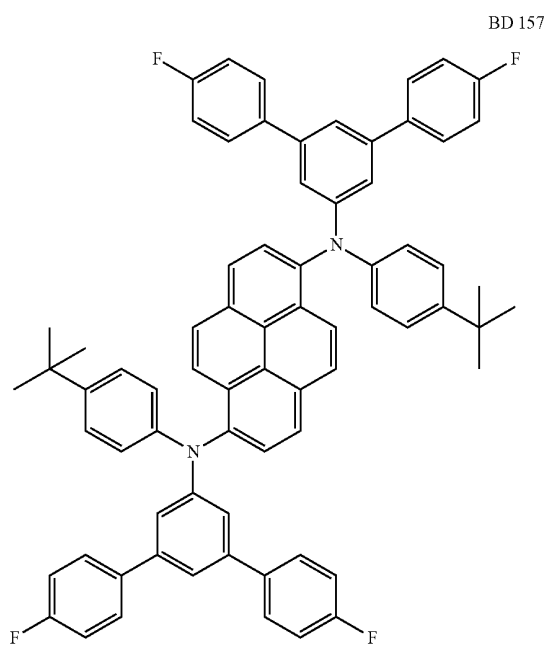
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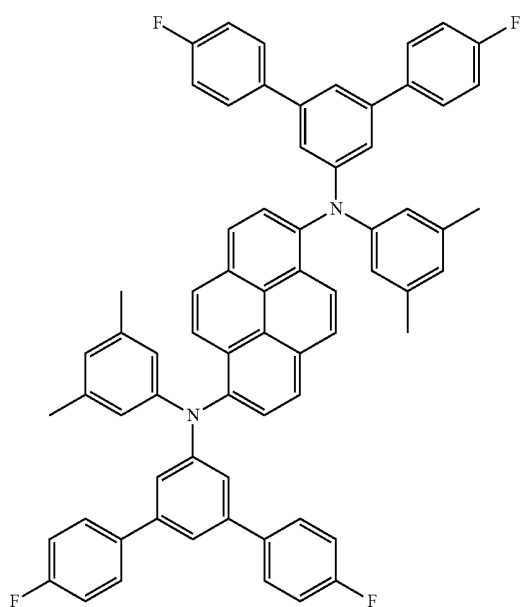
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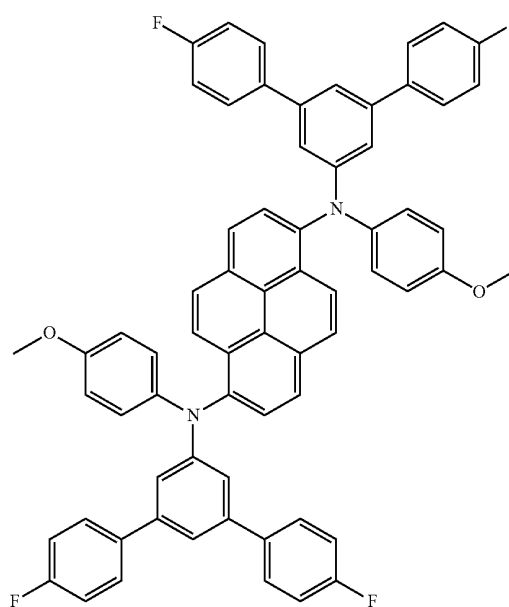
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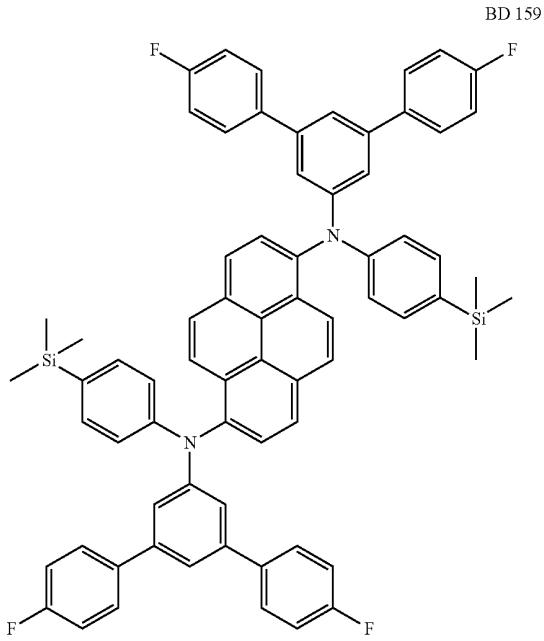
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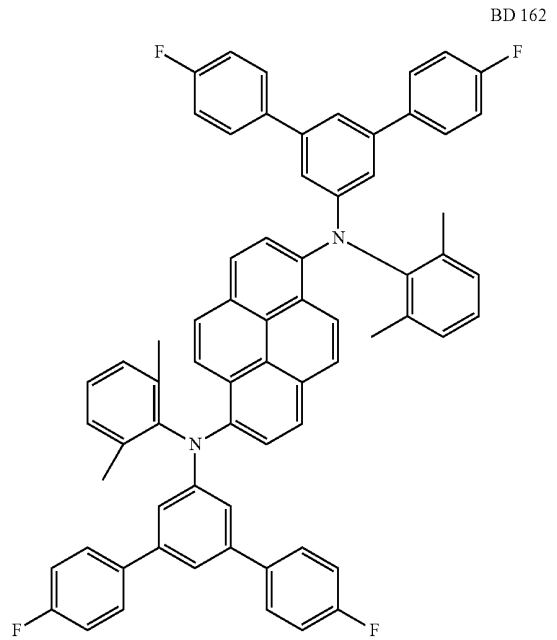
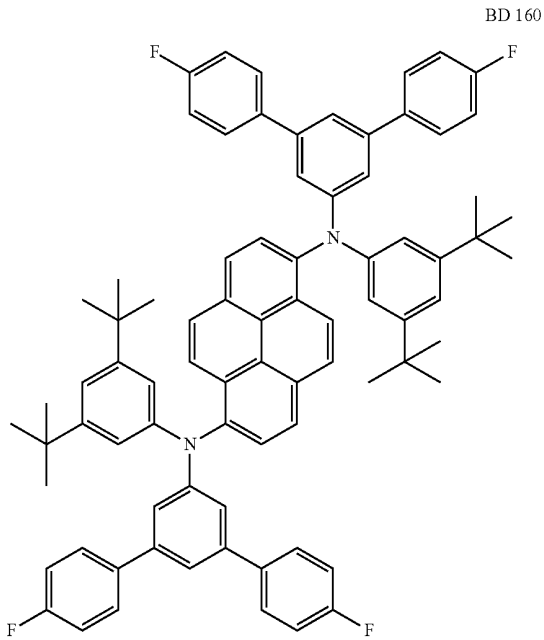
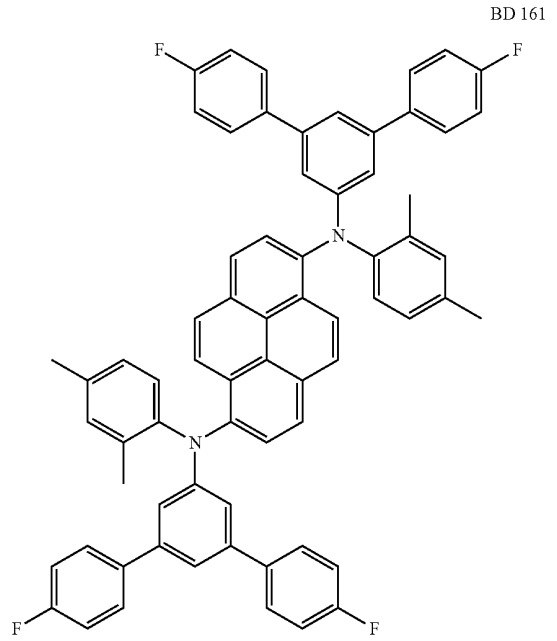
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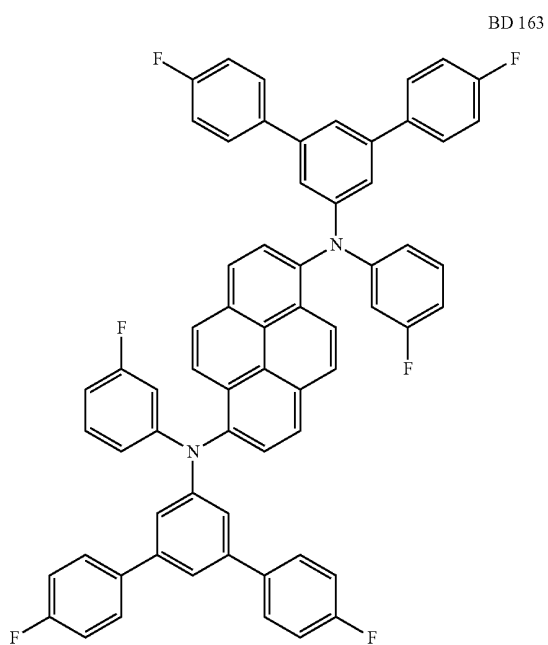
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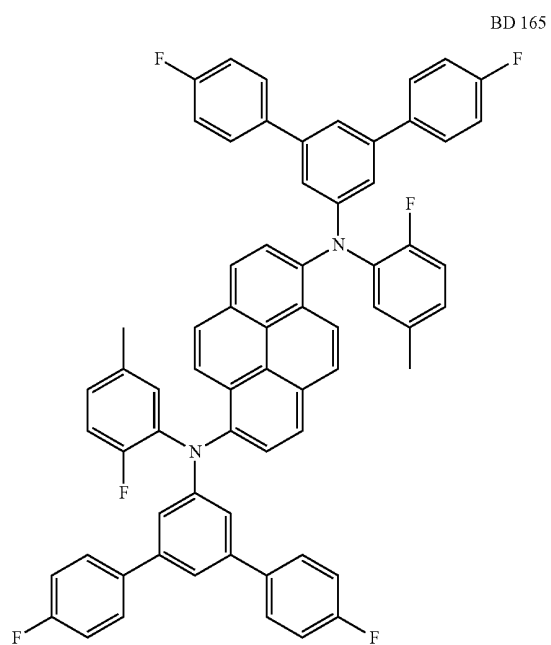
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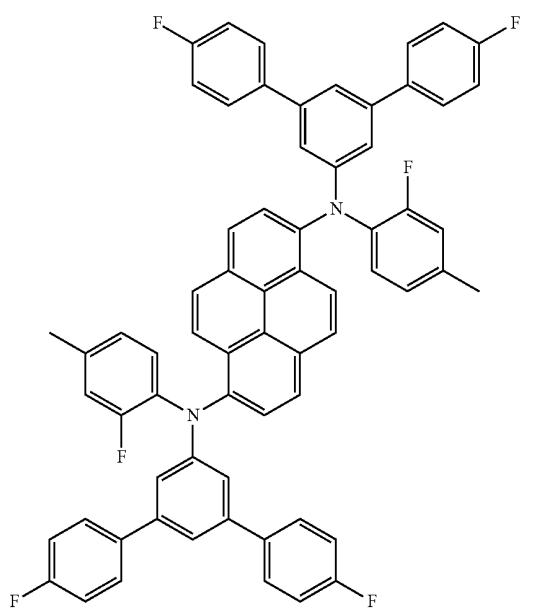
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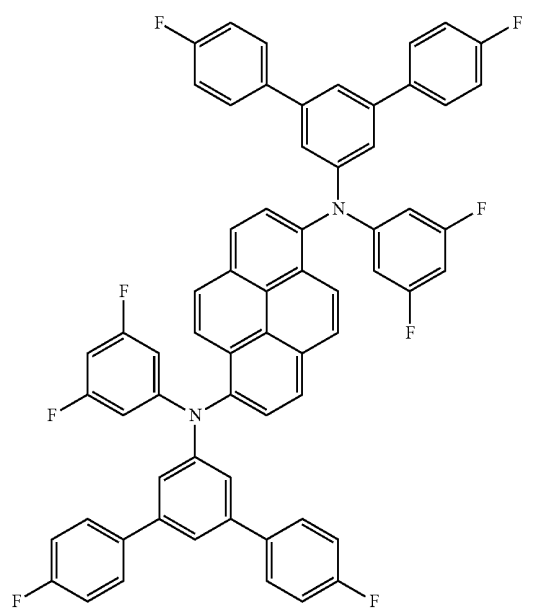
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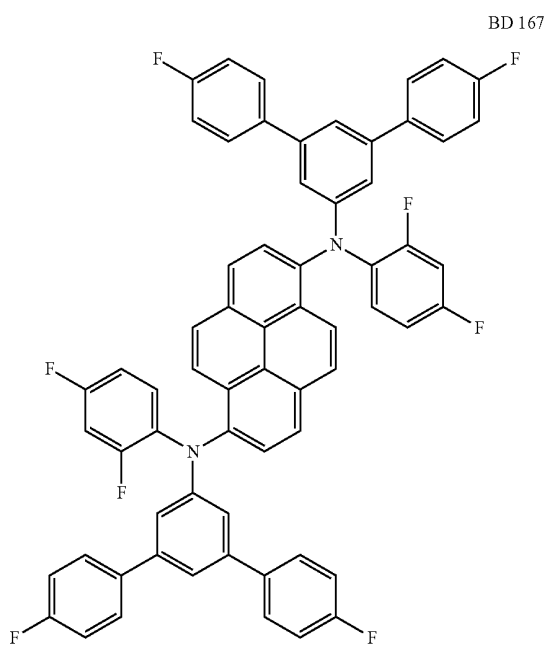
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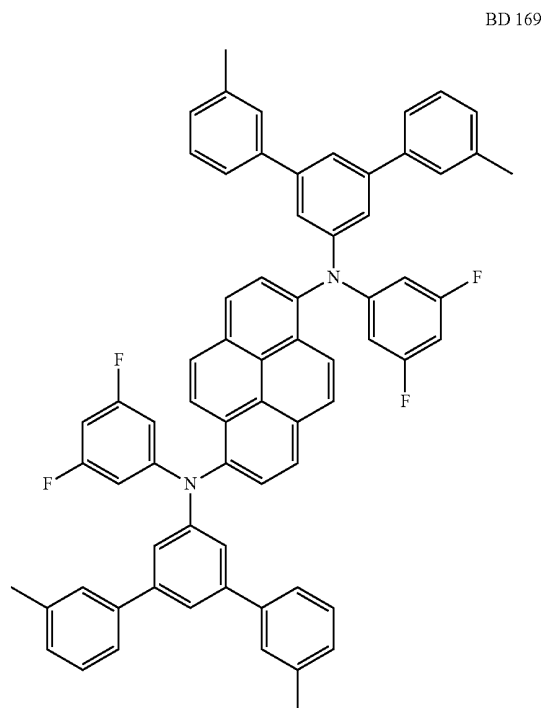
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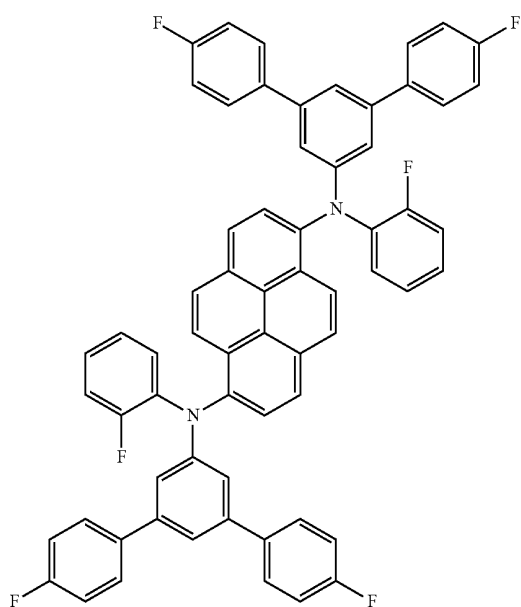
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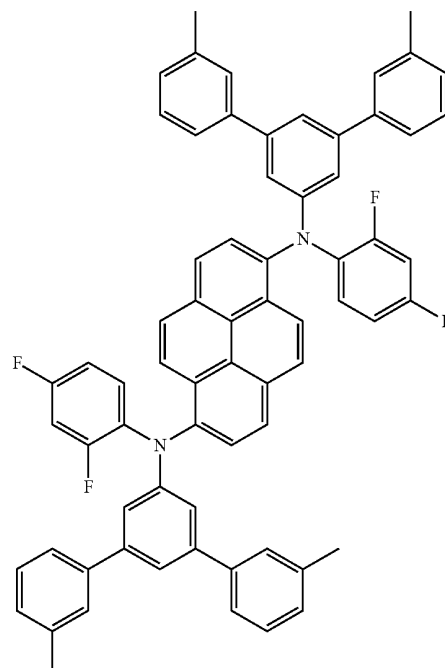
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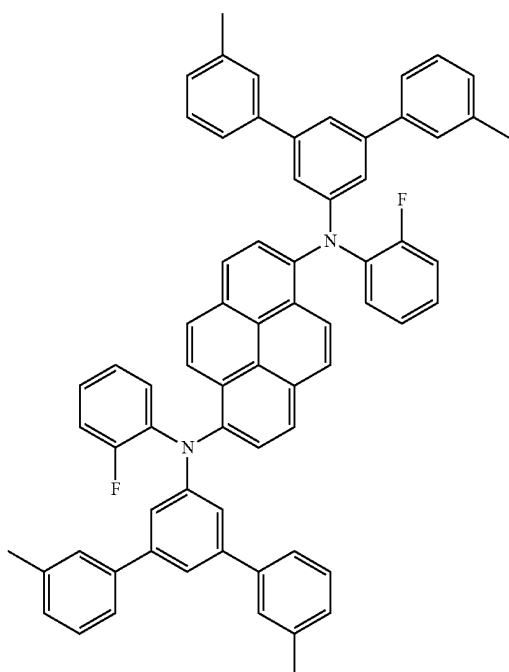


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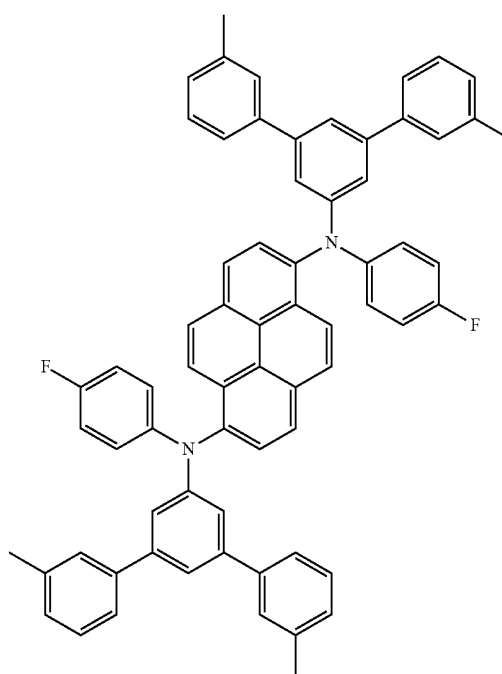
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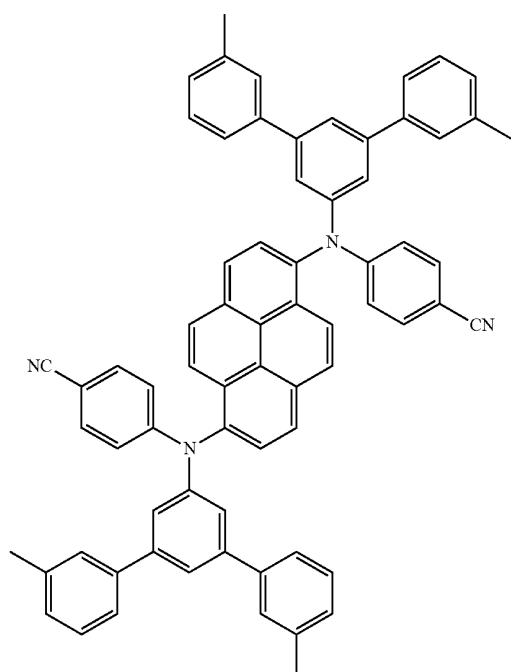


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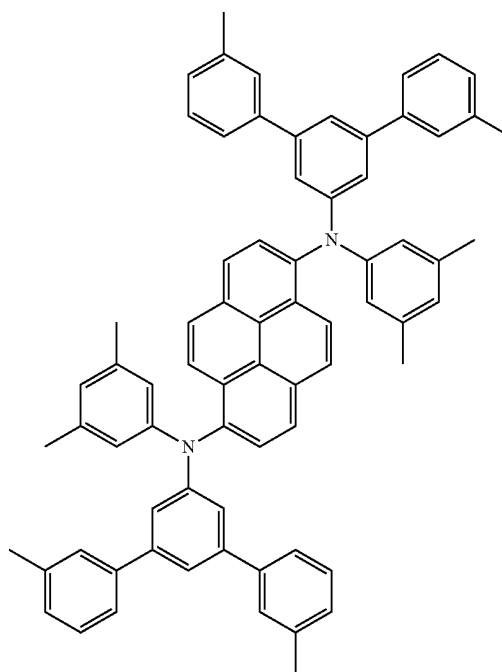
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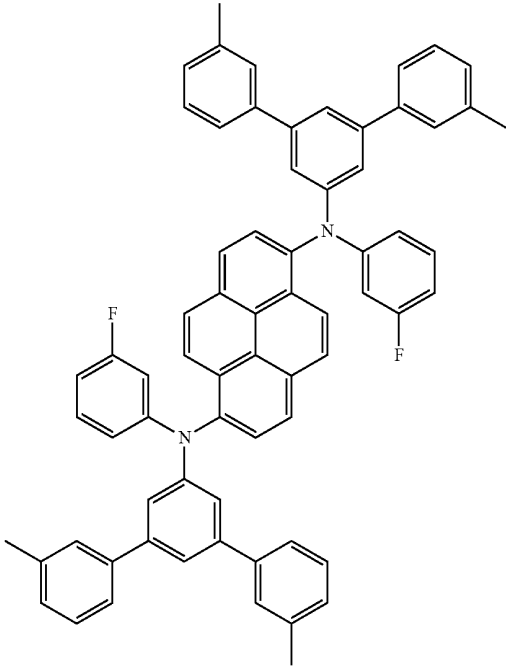


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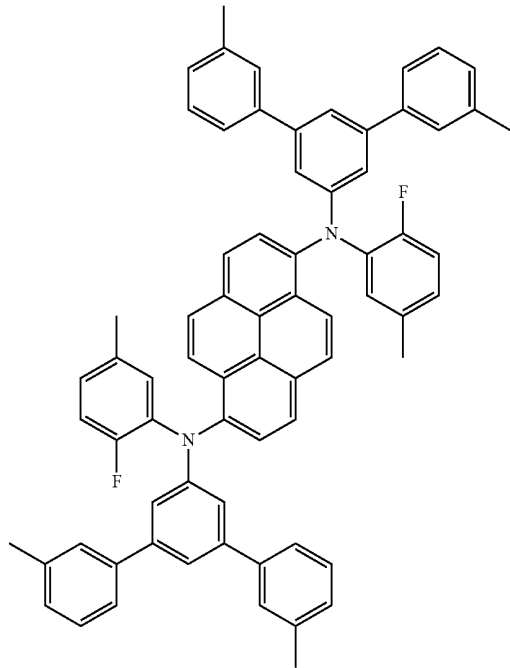
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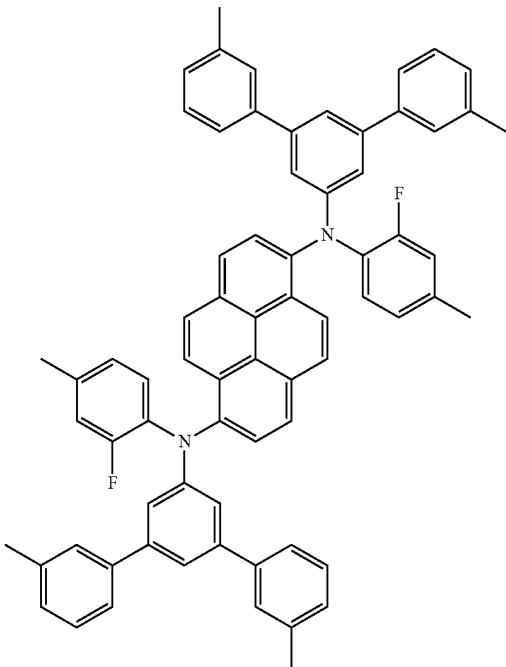


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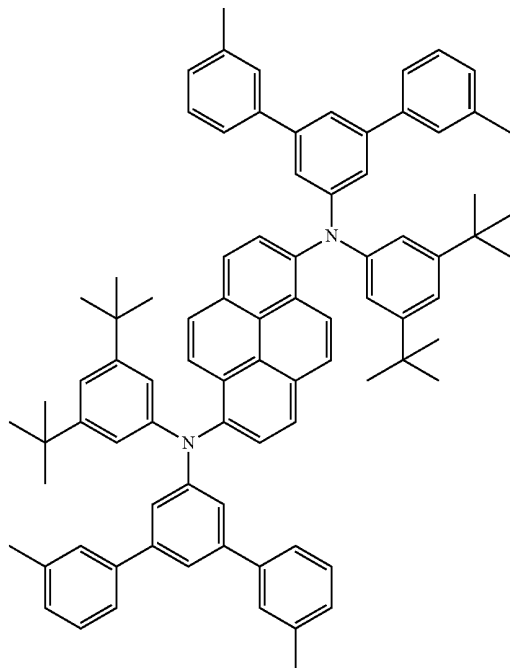
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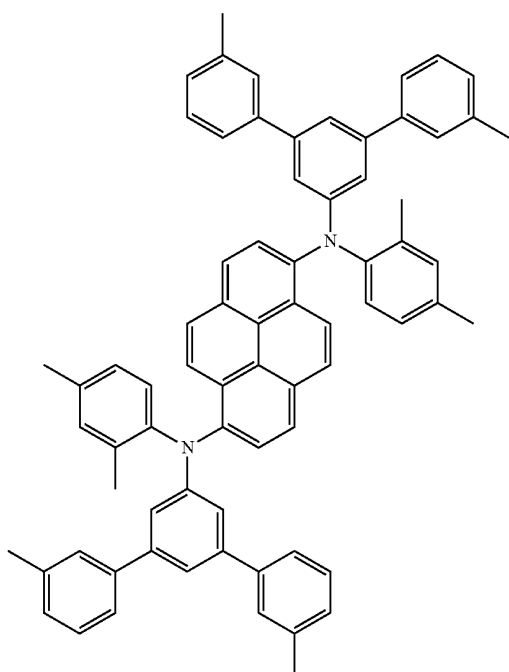


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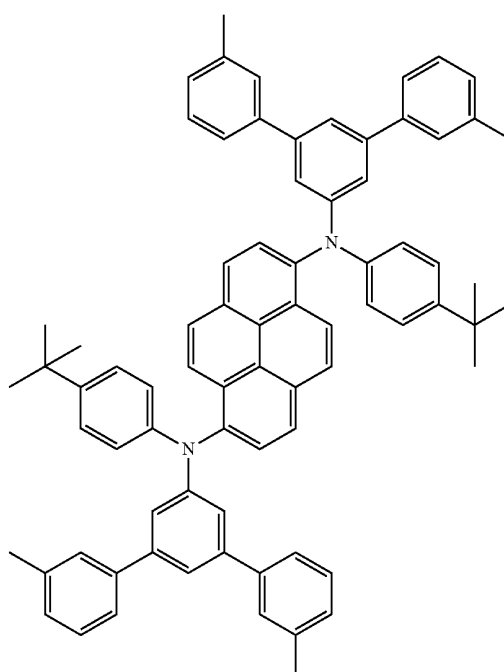
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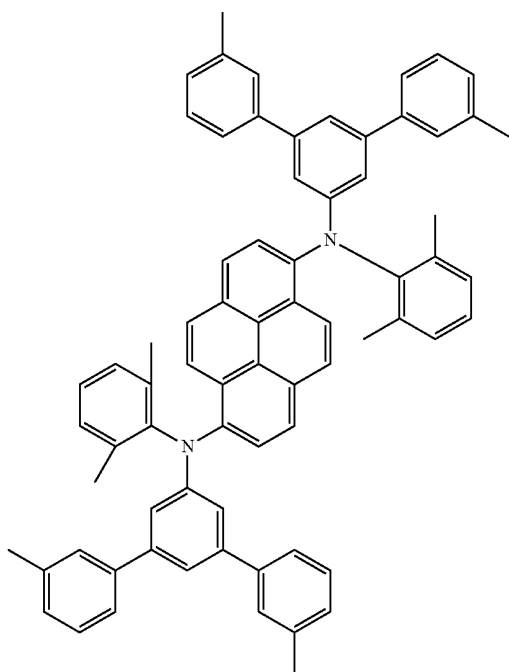


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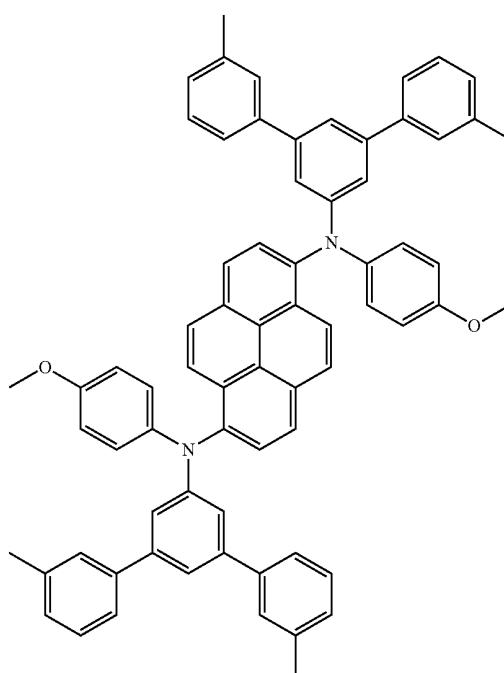
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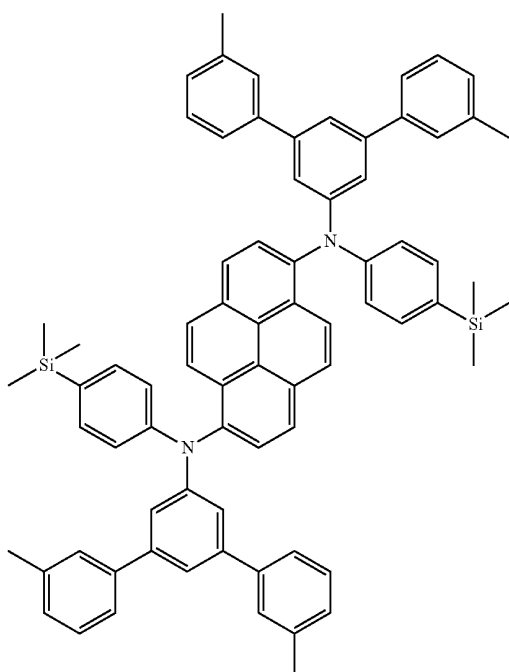


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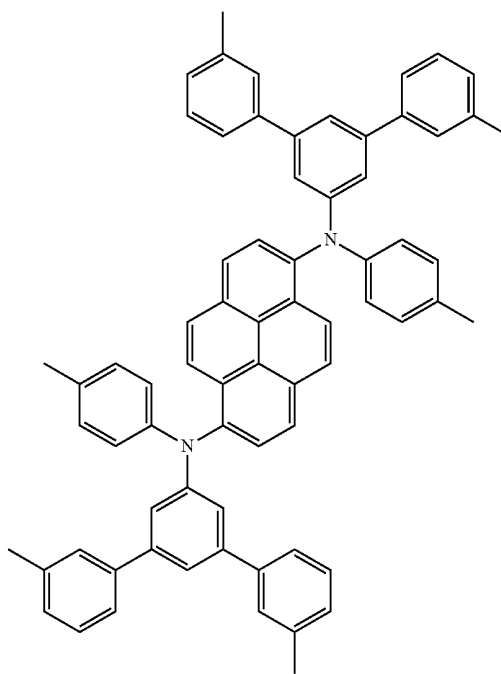
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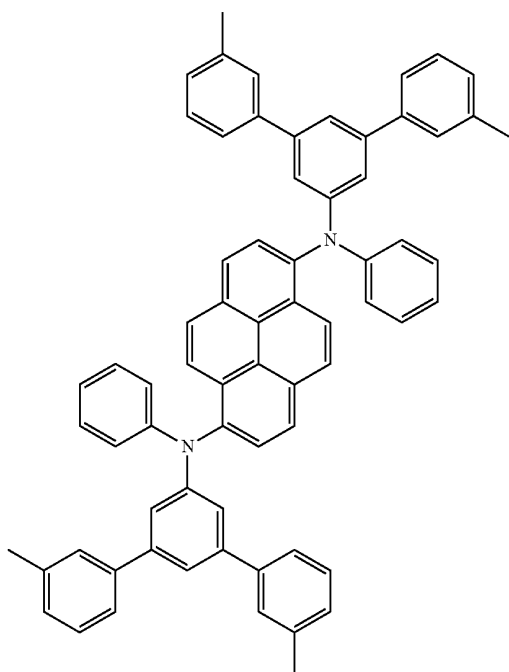


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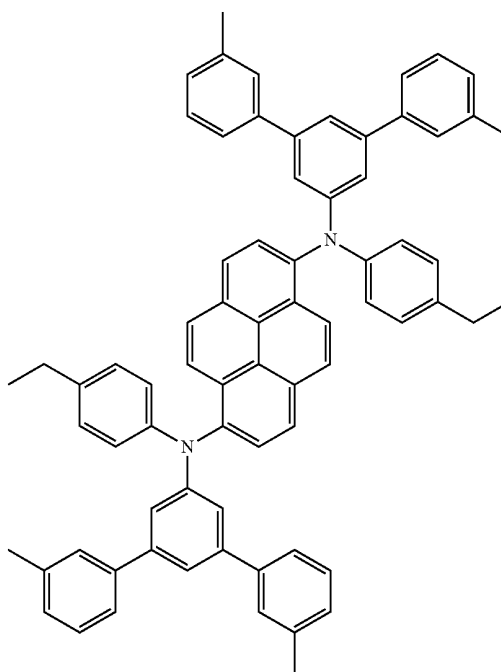
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BD 184

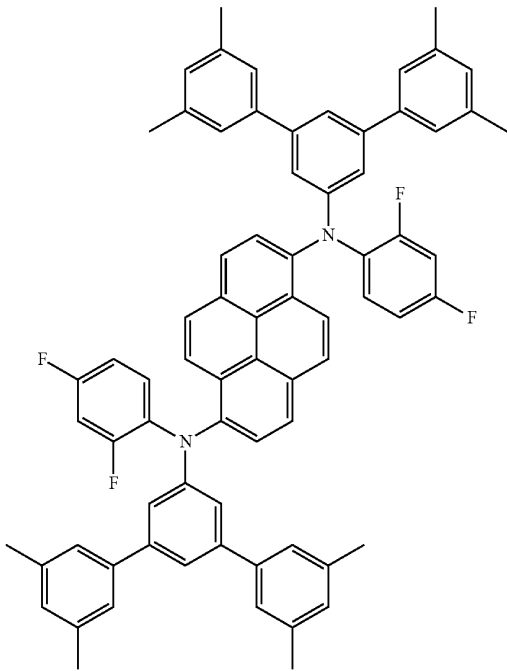


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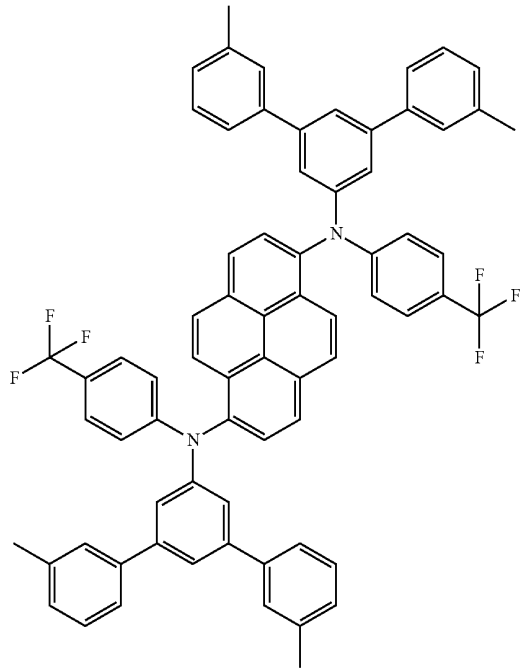
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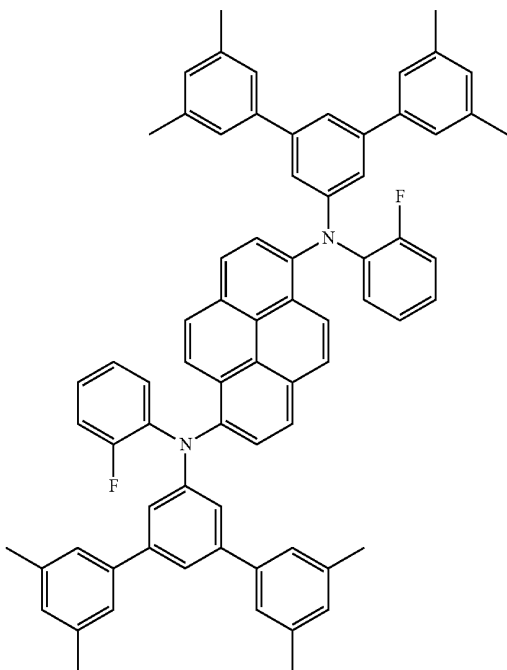


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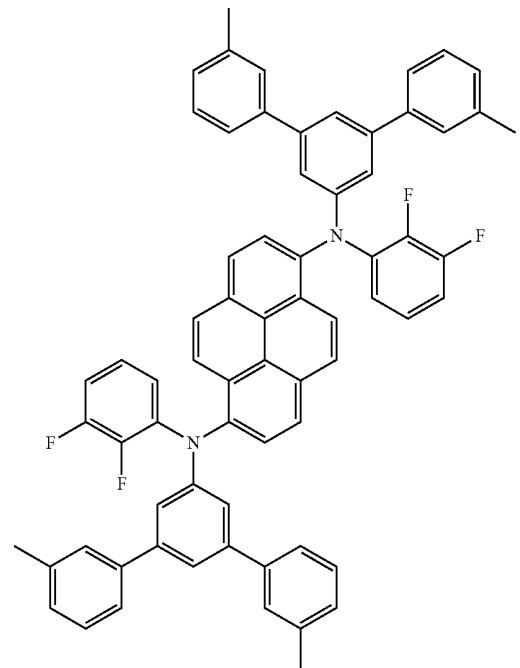
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BD 192

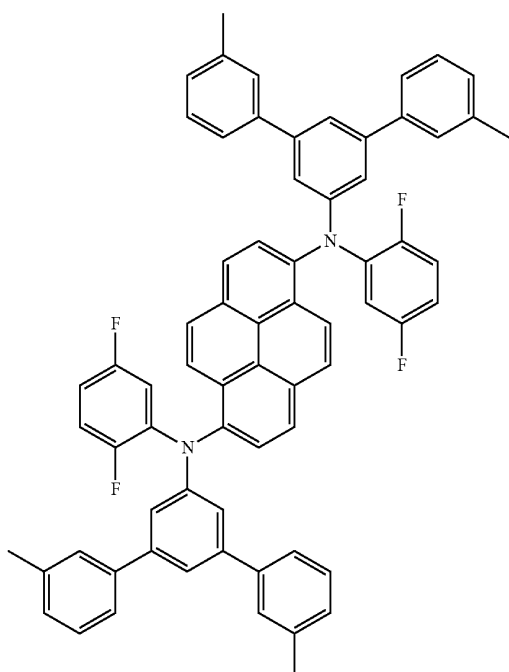


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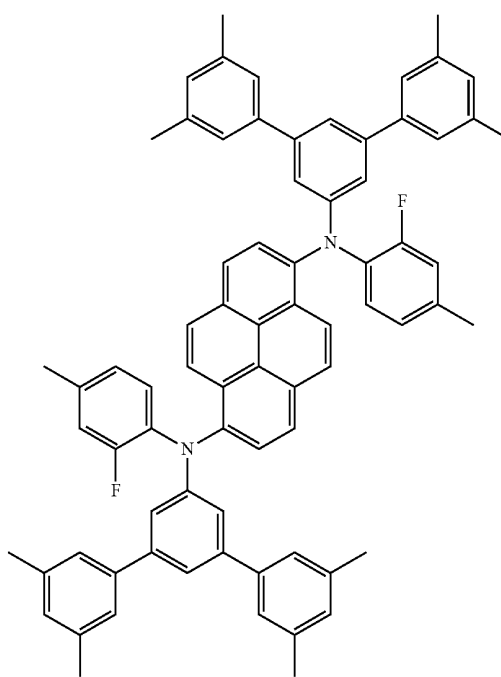
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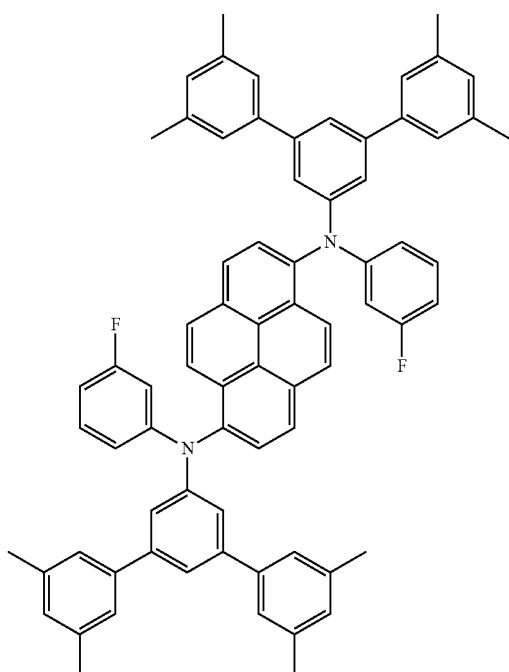


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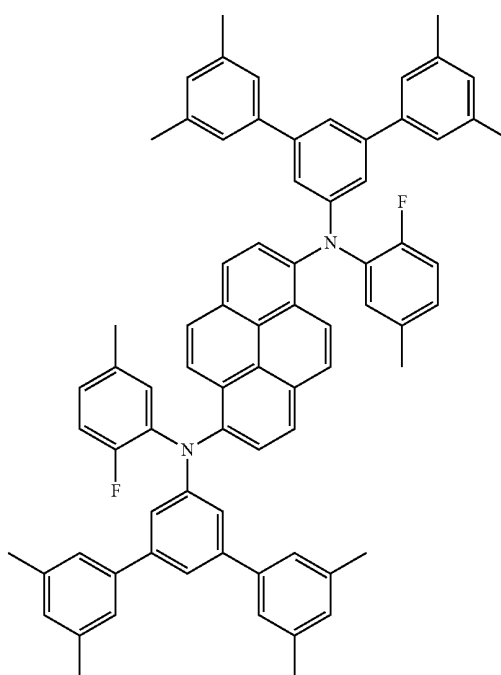
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BD 196

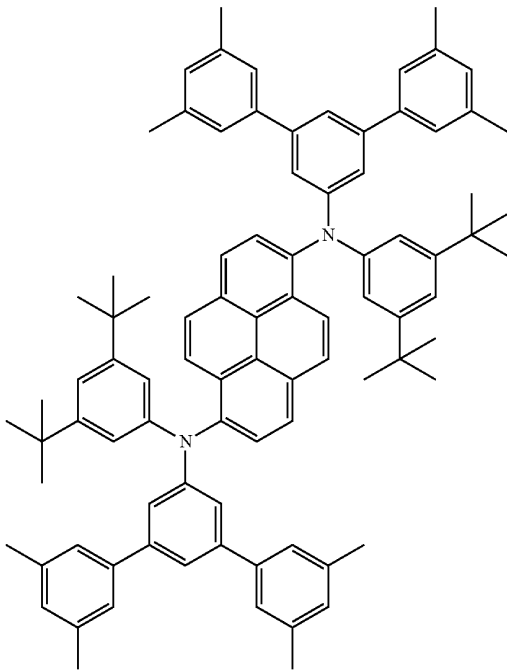


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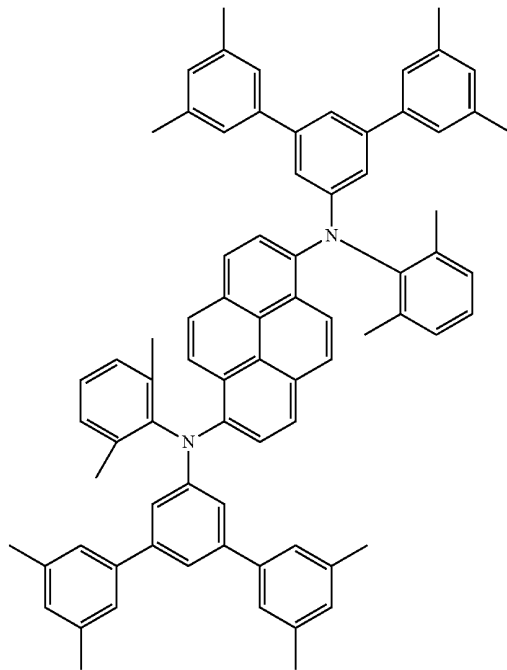
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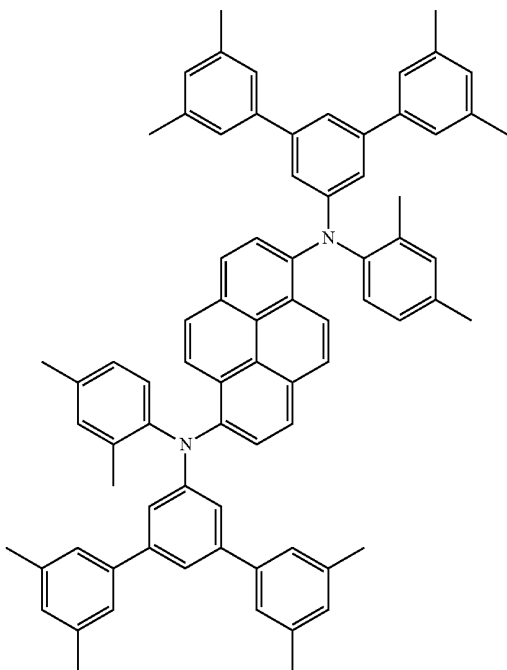


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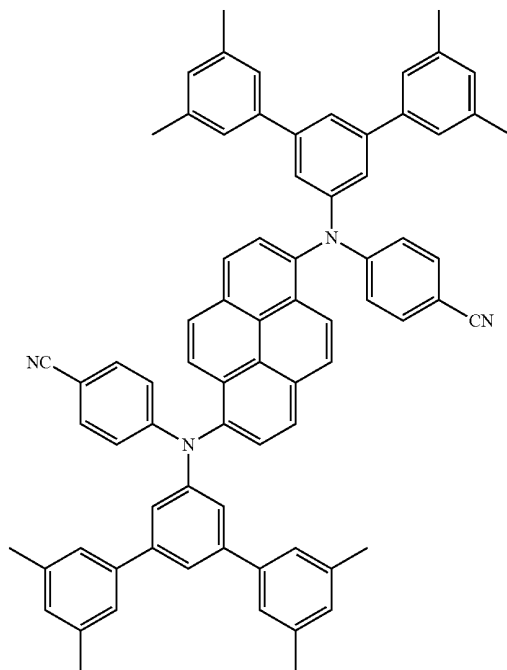
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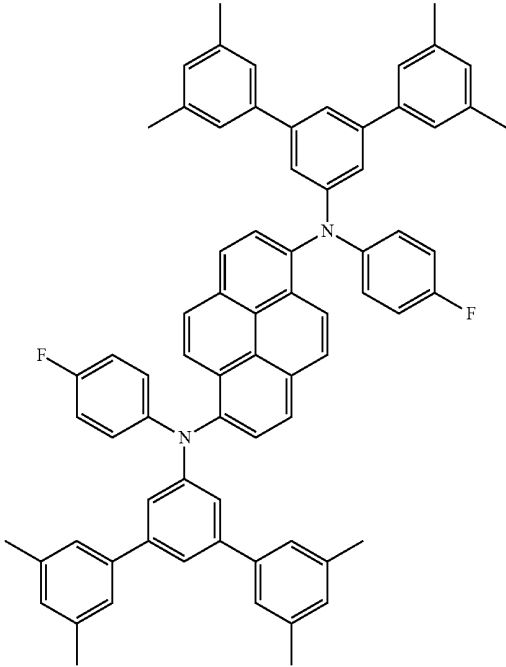


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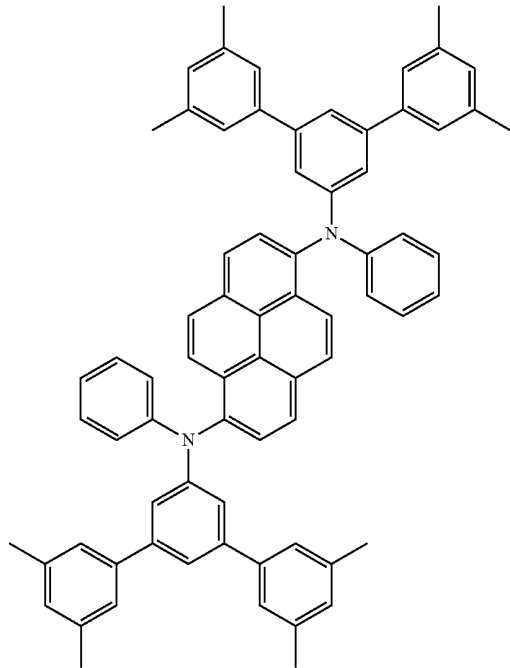
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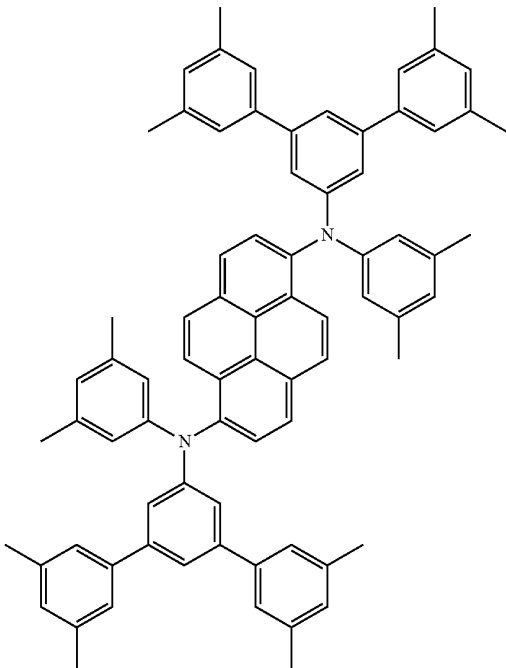


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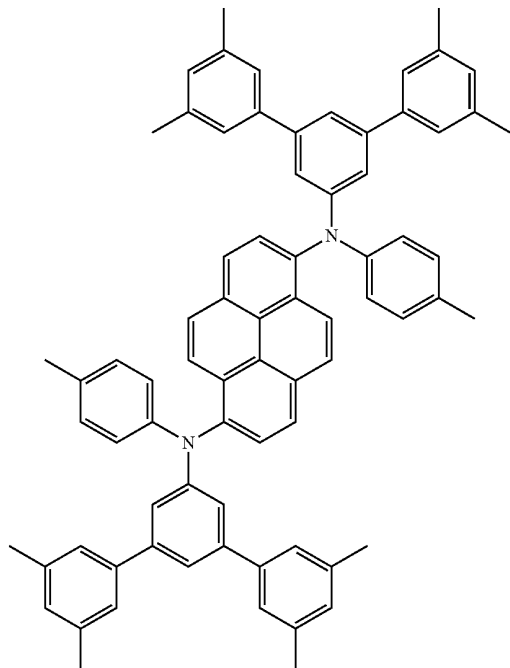
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BD 204

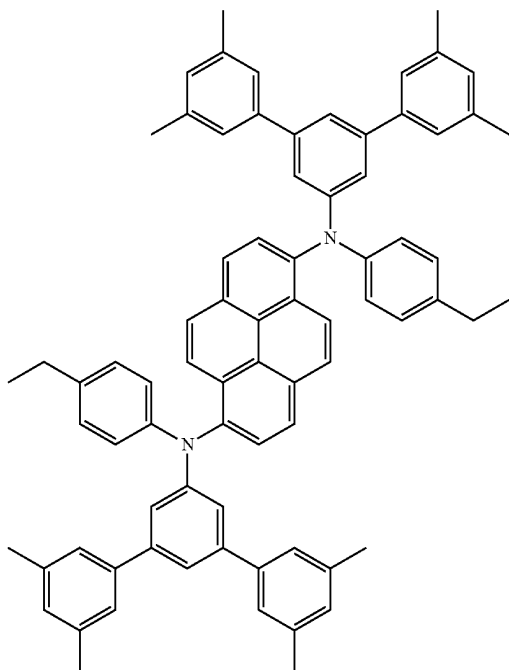


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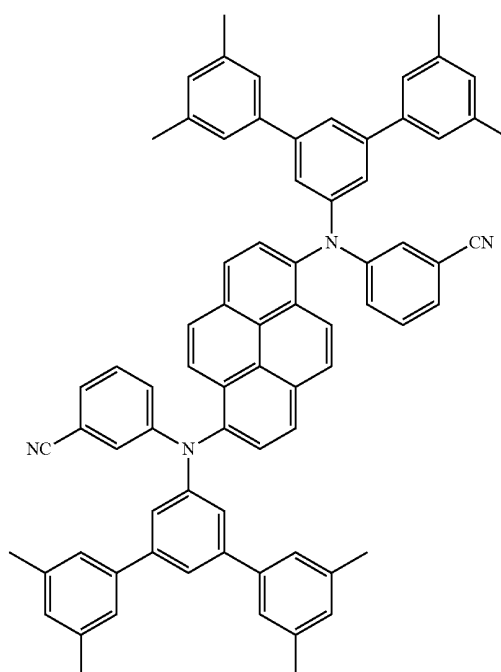
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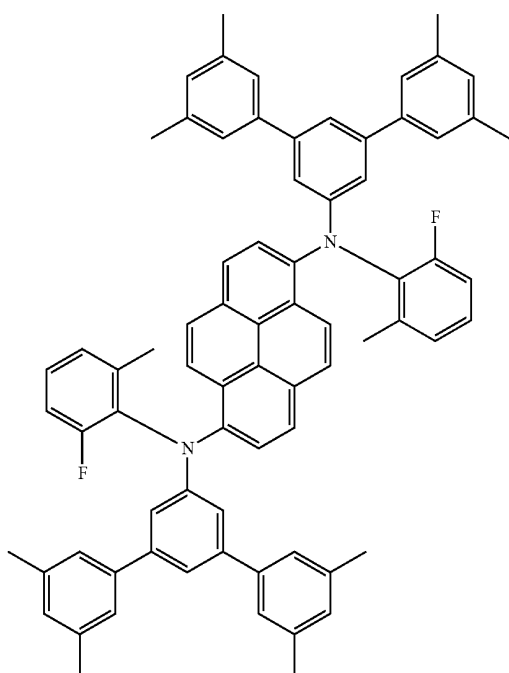


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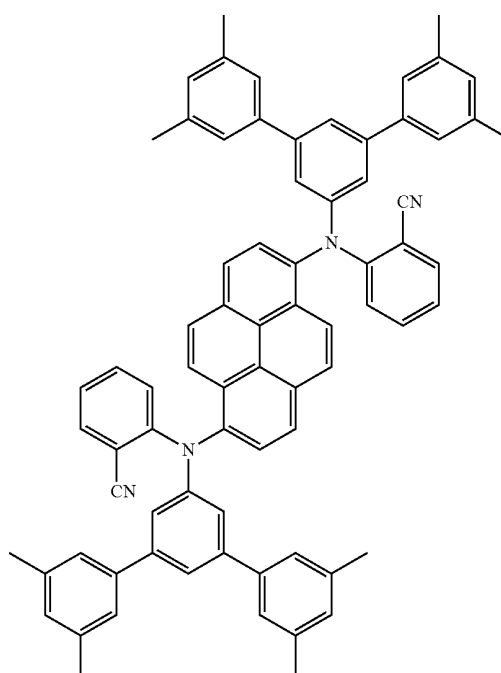
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BD 208

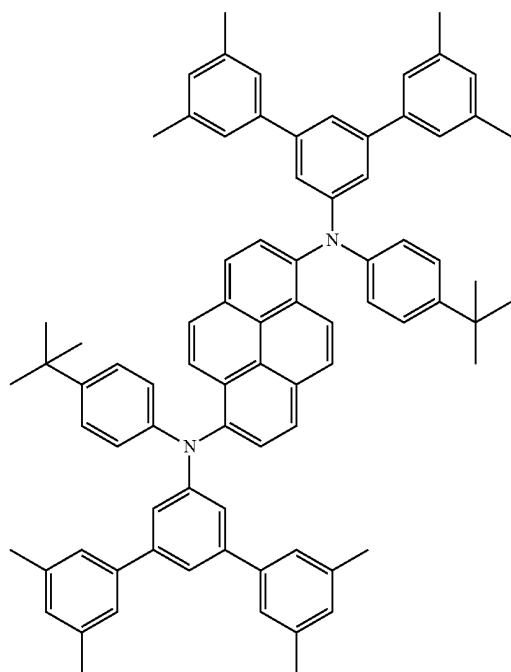


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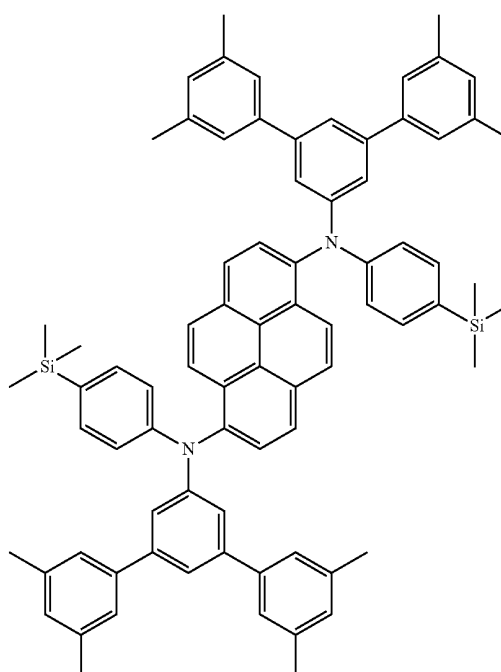
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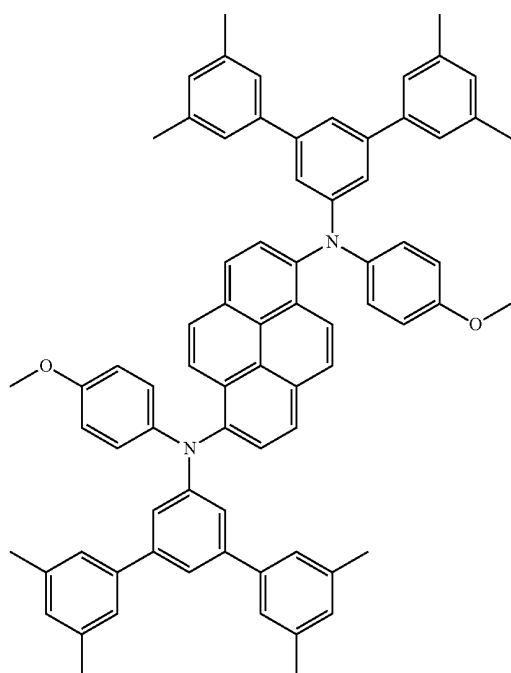


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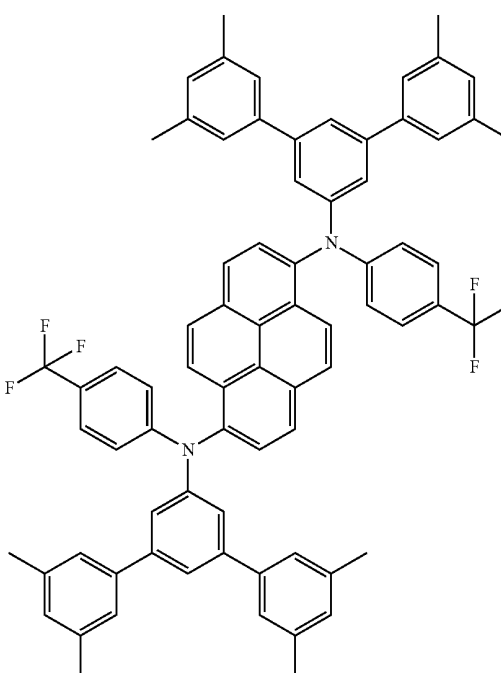
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BD 212

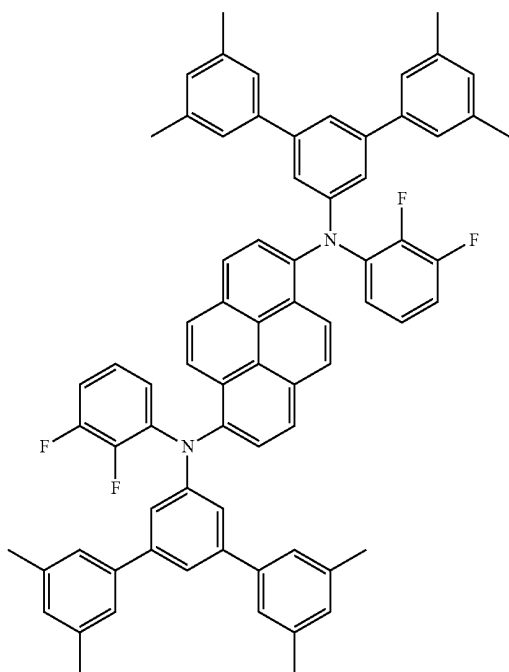


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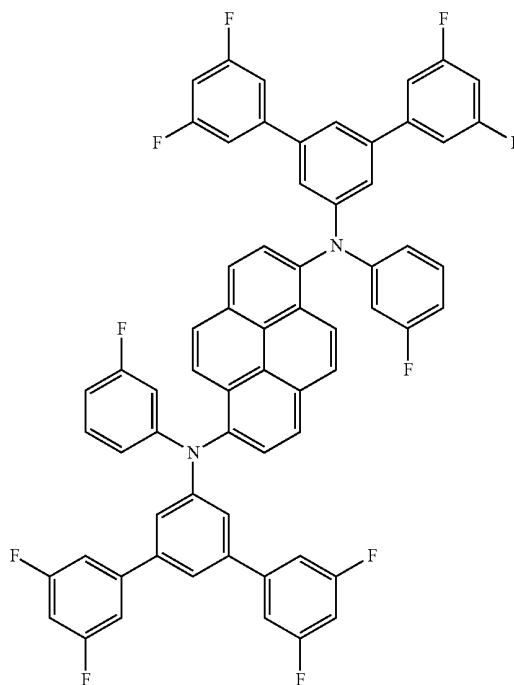
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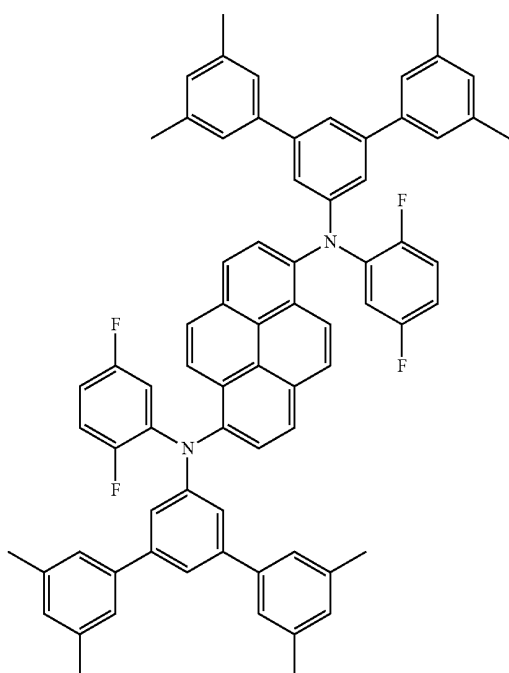


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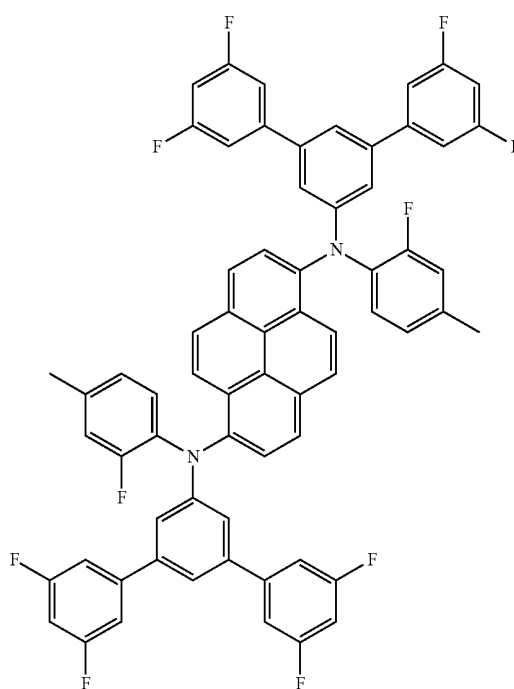
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BD 216

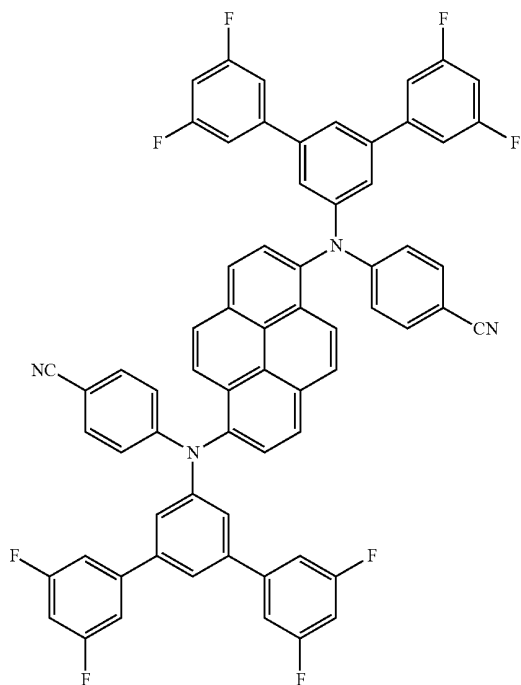


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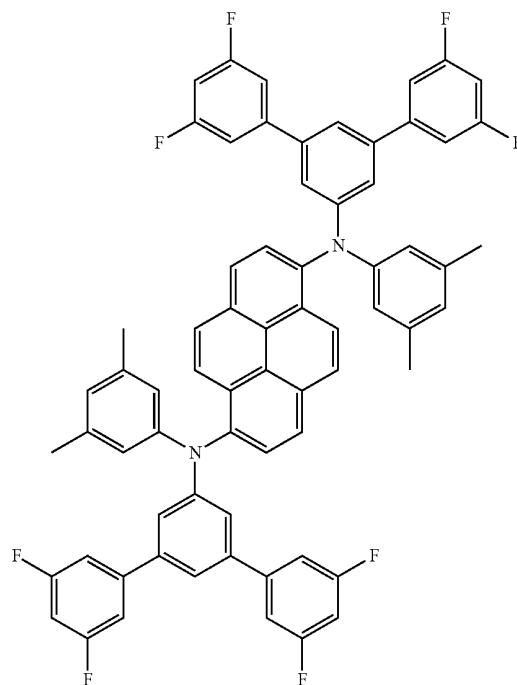
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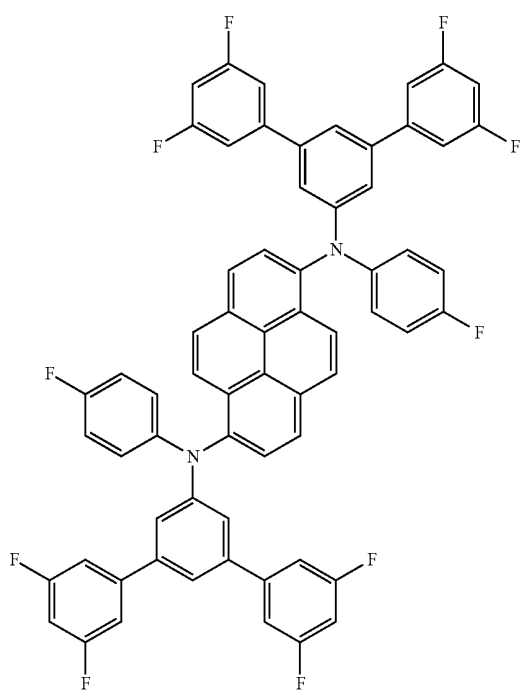


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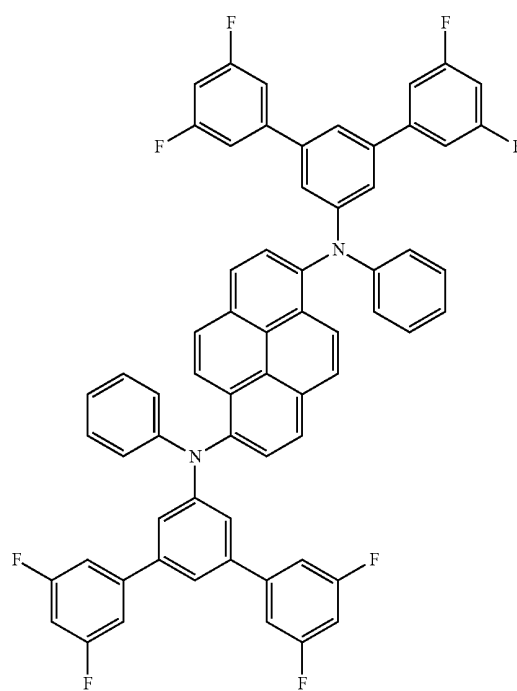
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BD 224

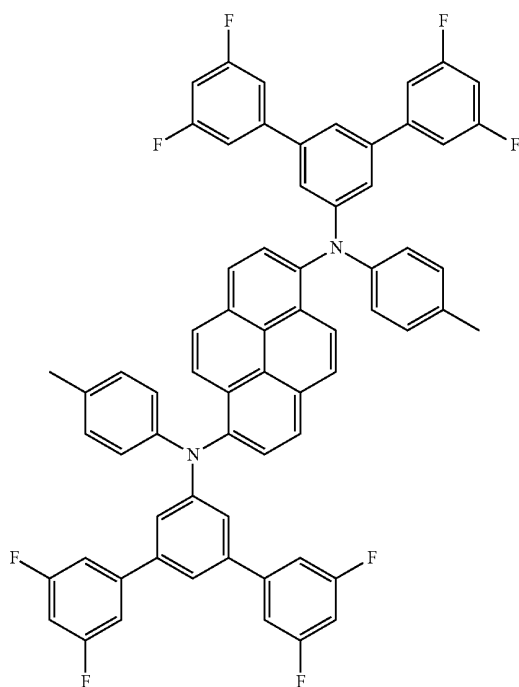


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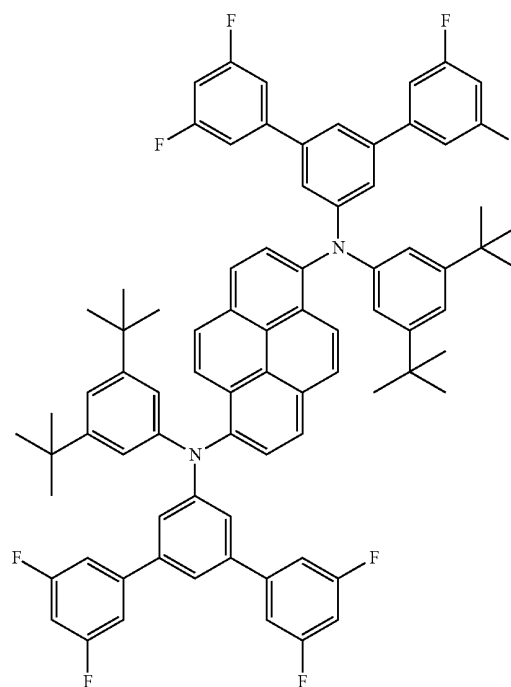
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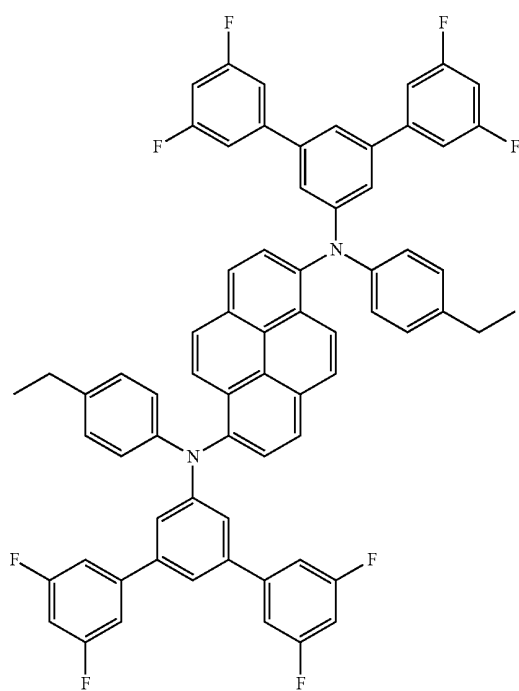


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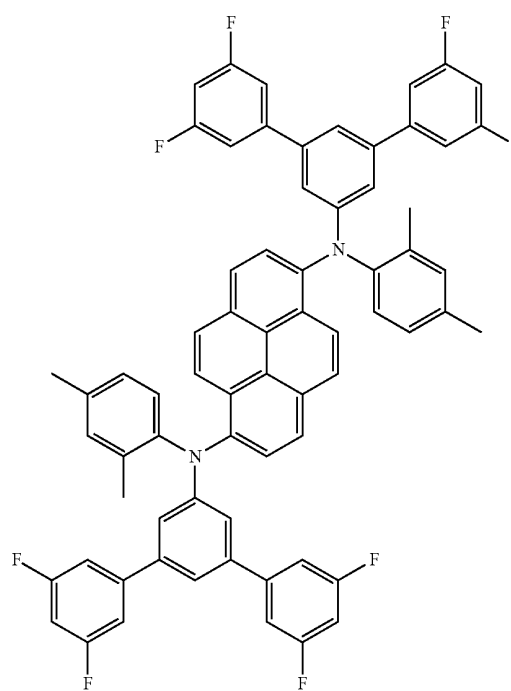
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BD 228

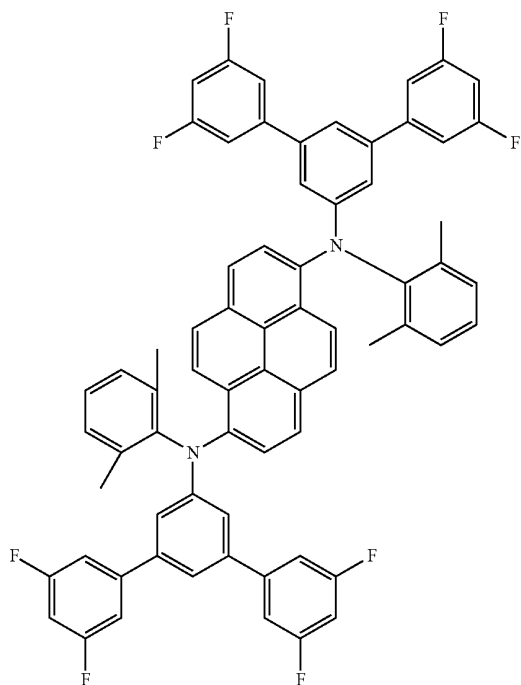


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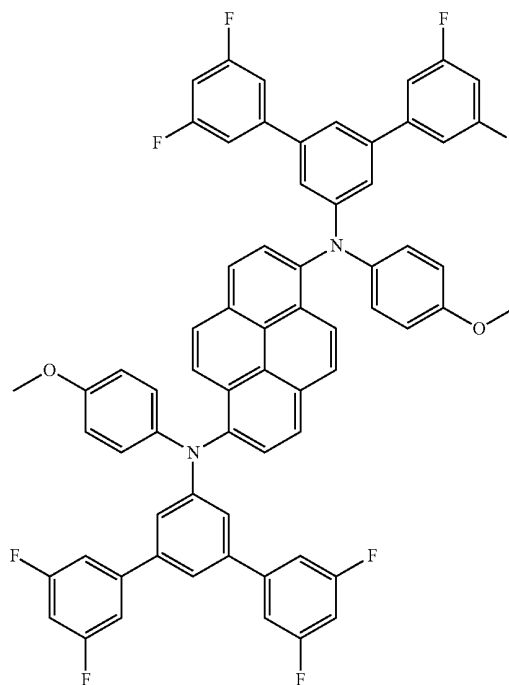
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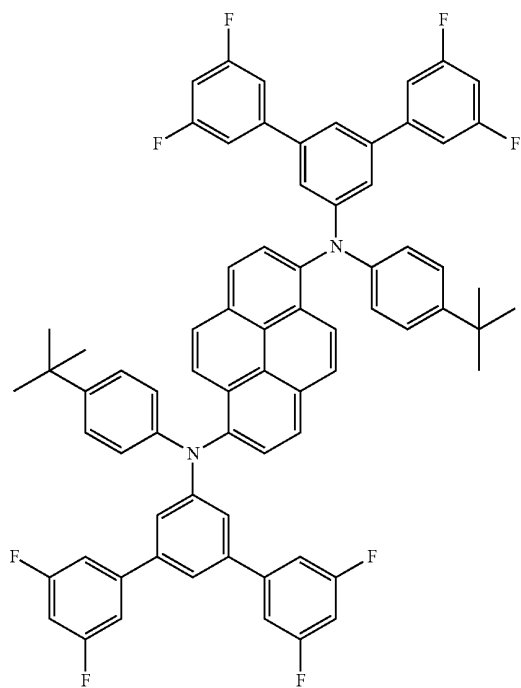


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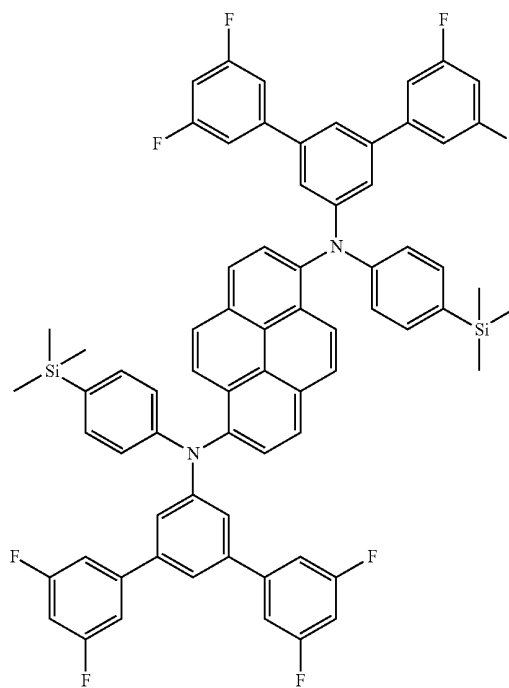
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BD 232

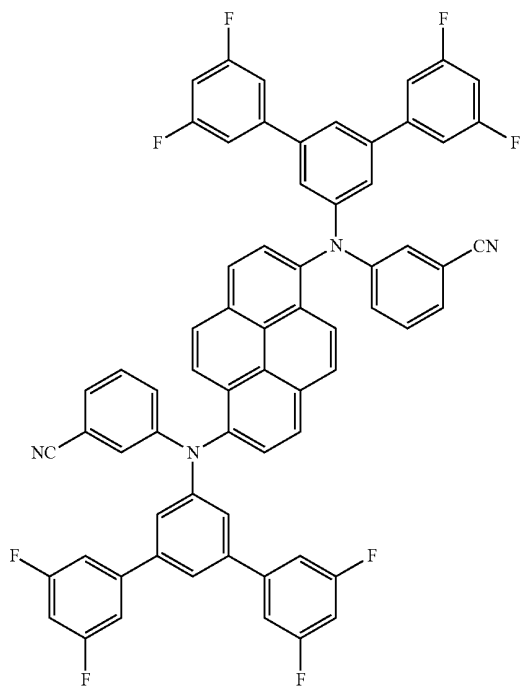


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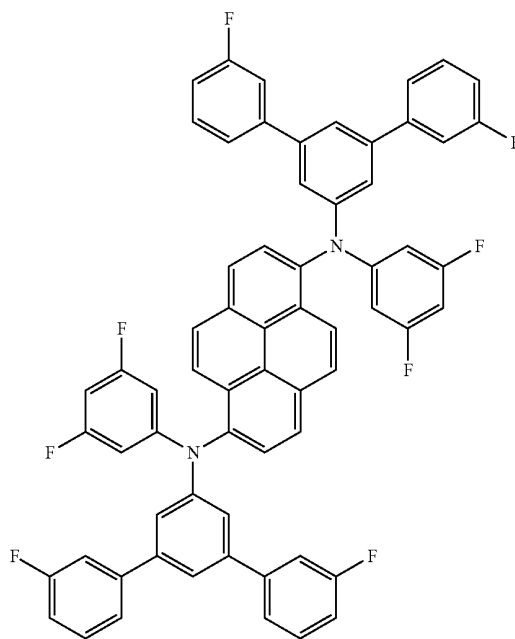
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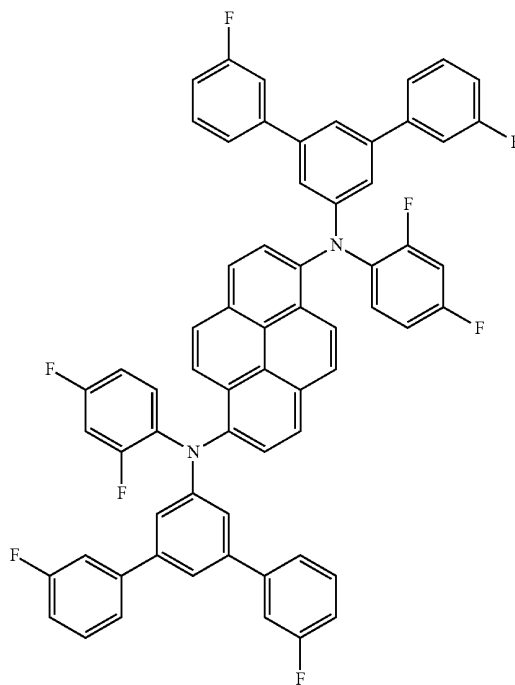
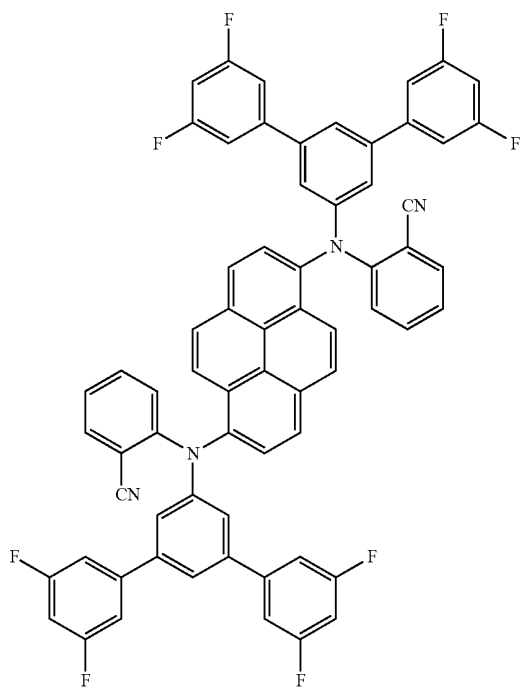
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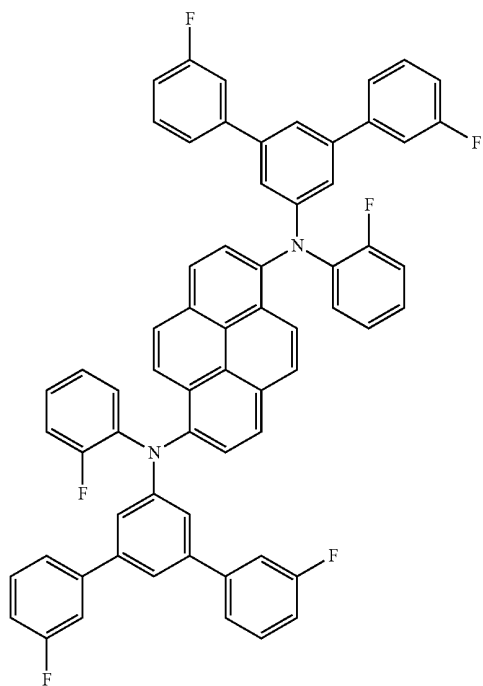
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BD 240



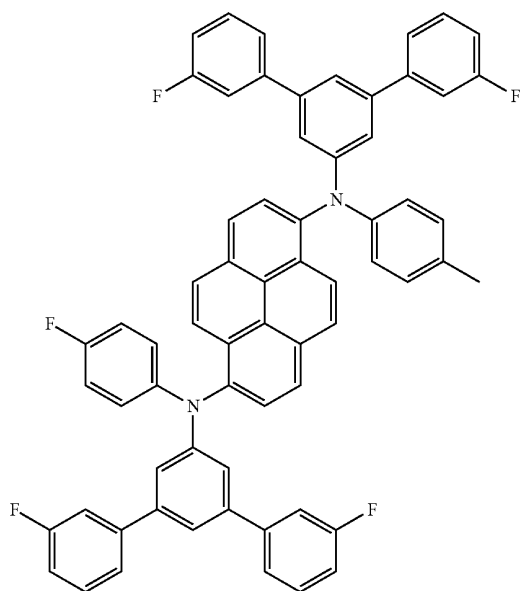
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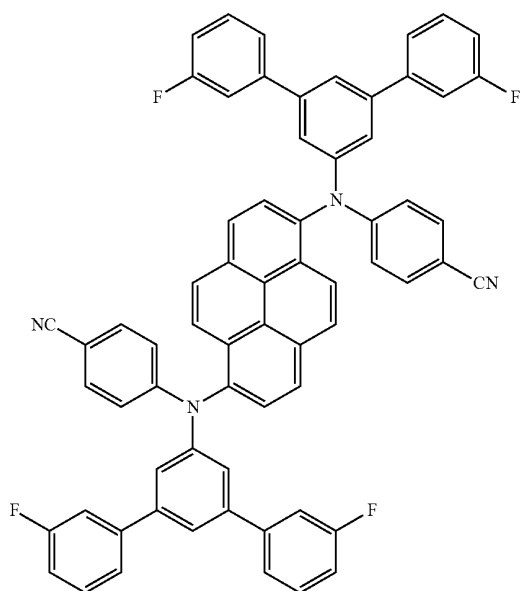


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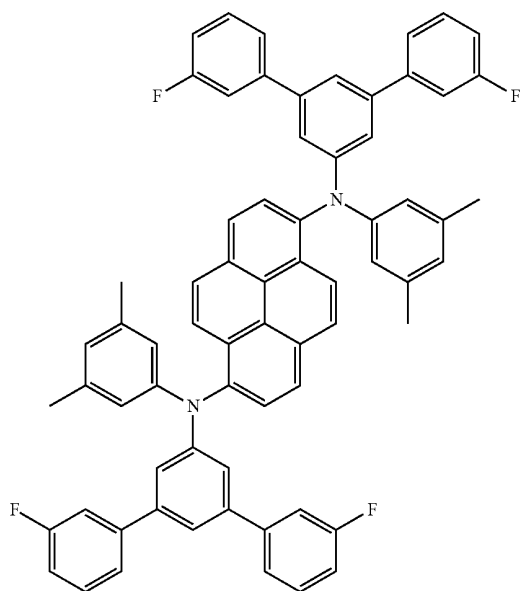
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BD 244

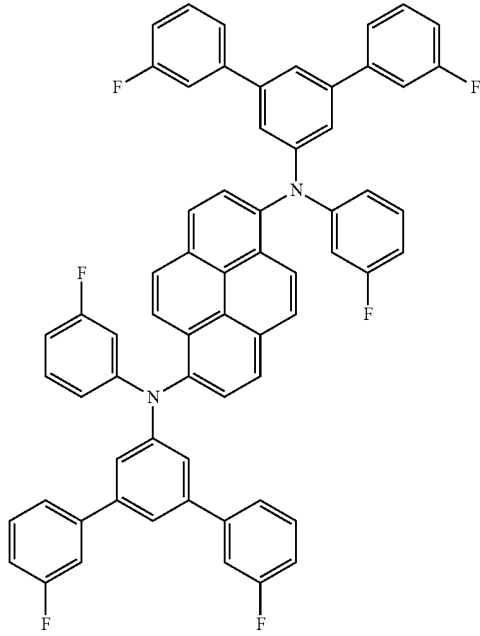


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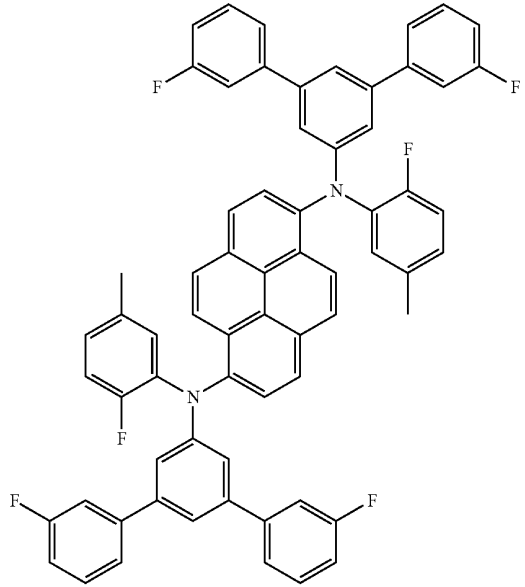
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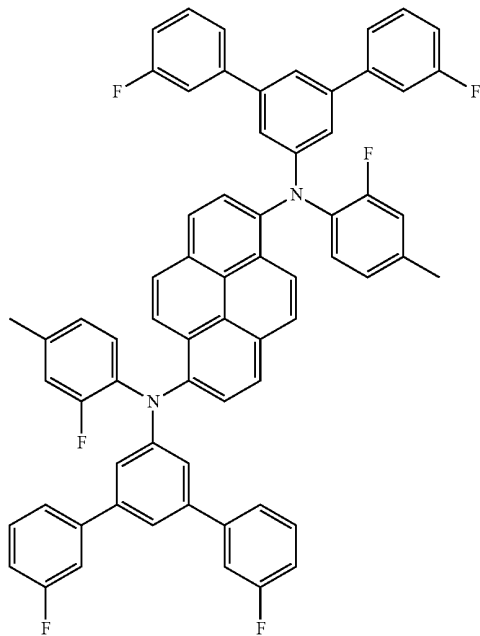


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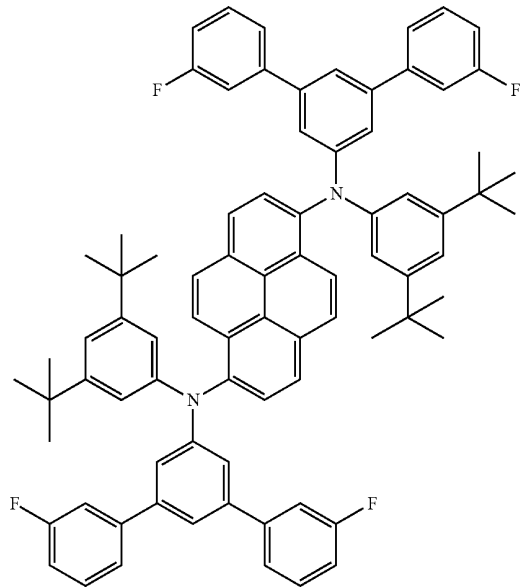
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BD 248

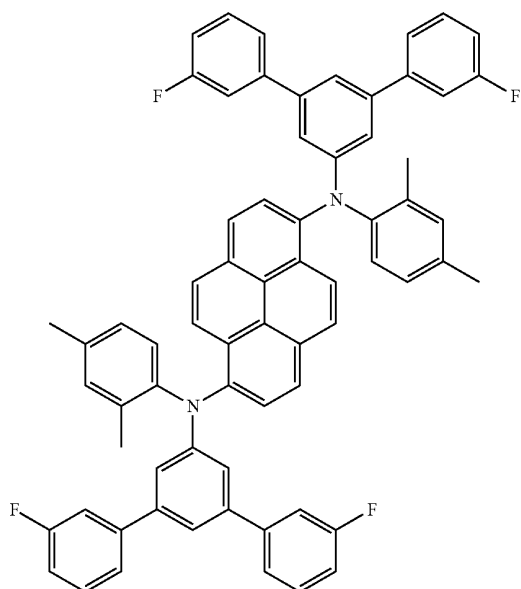


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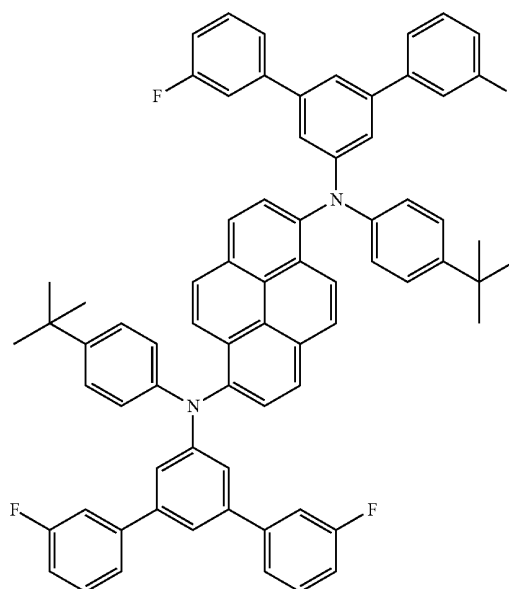
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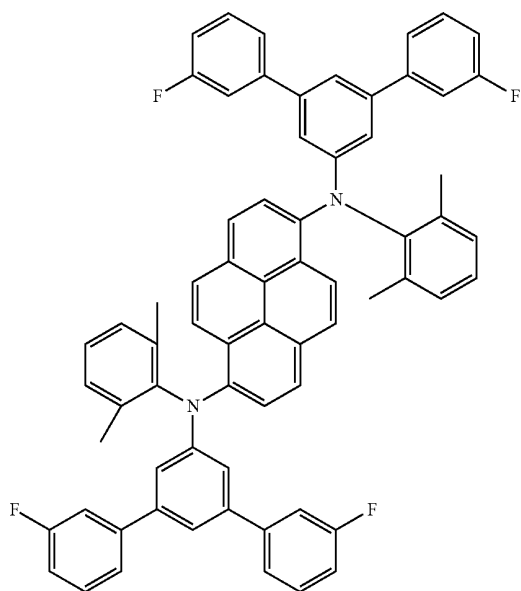


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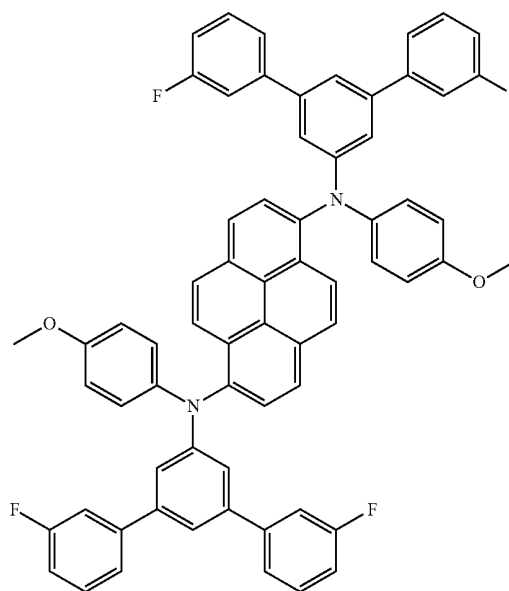
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BD 252

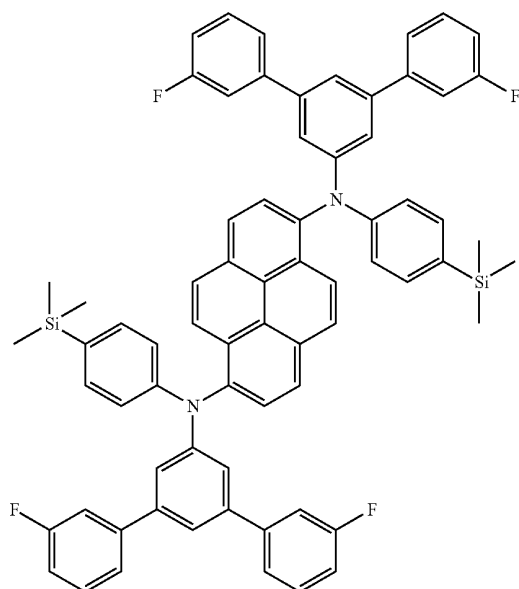


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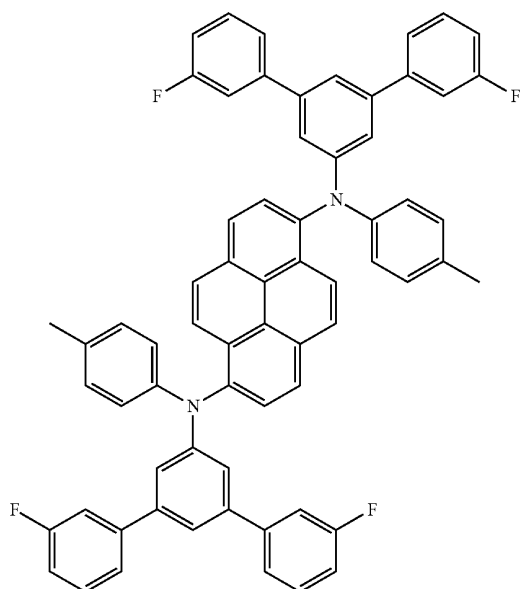
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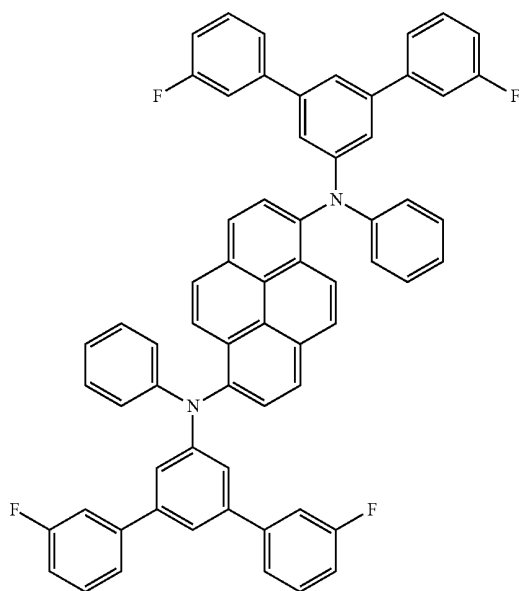


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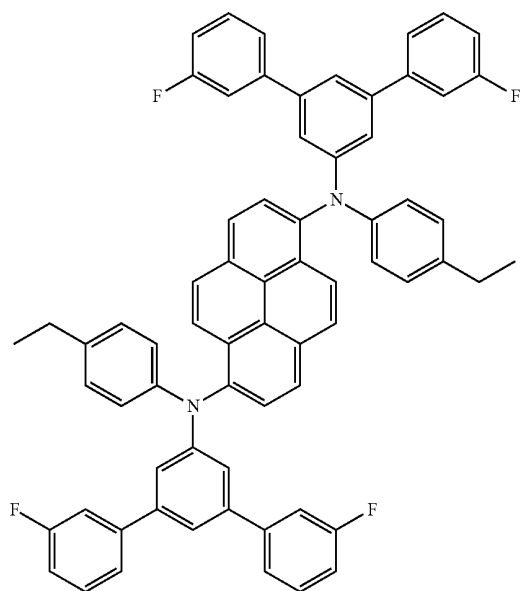
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BD 256

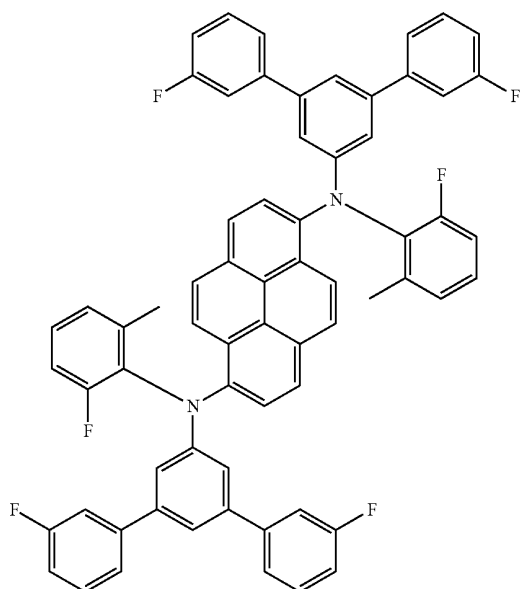


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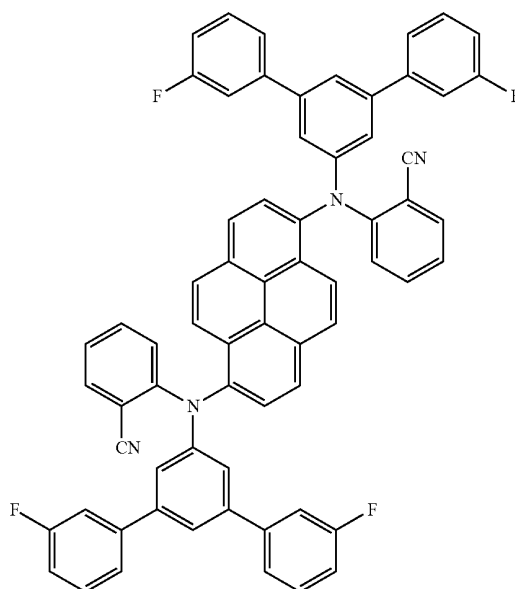
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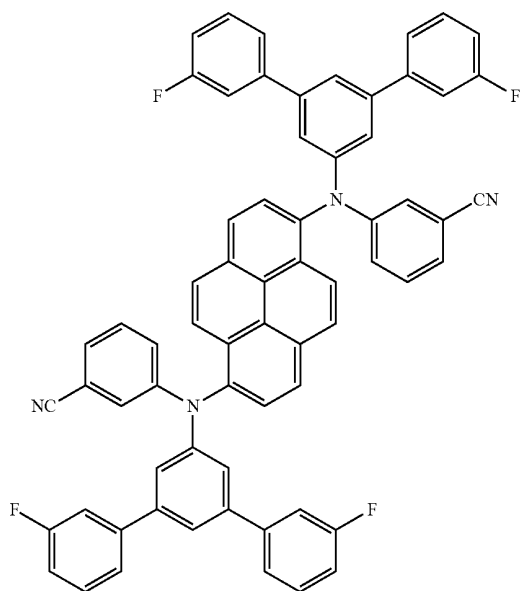


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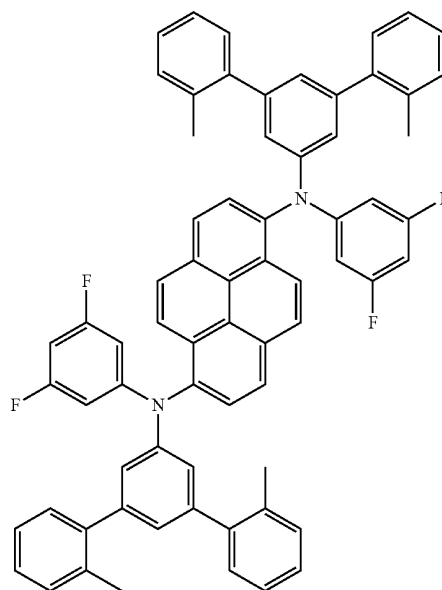
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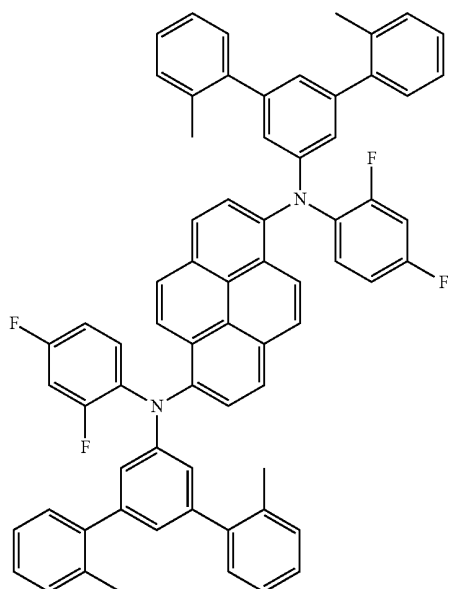
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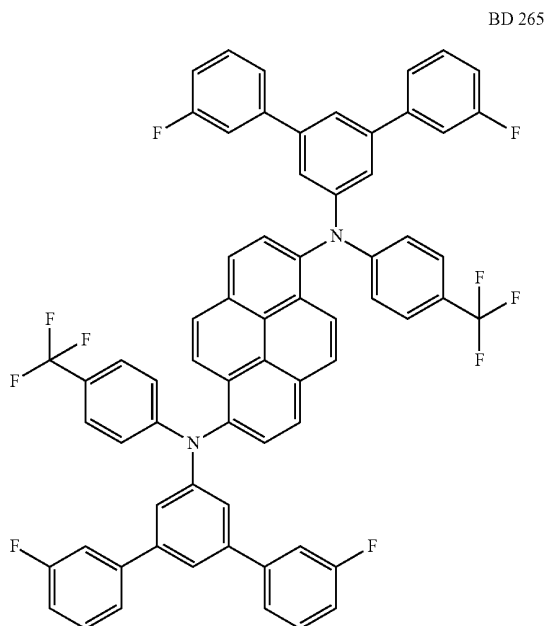
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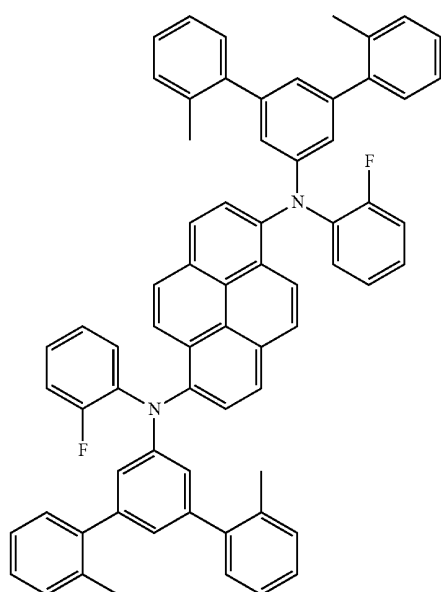
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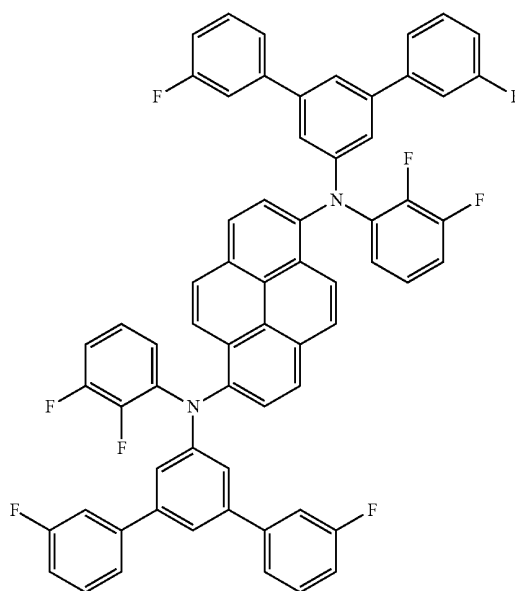
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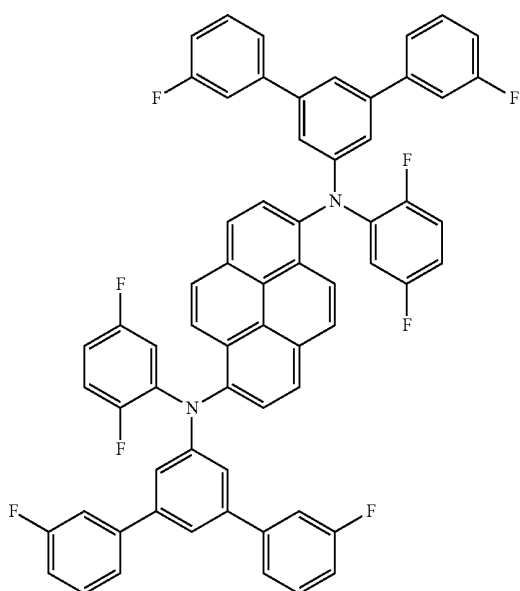


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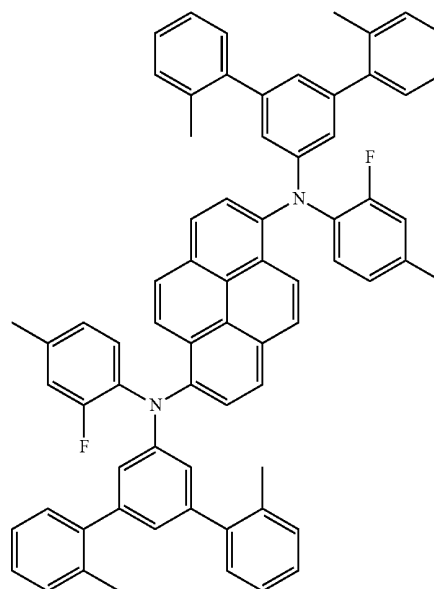
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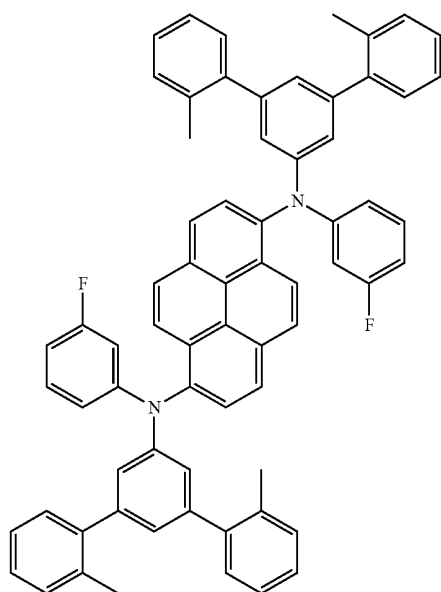


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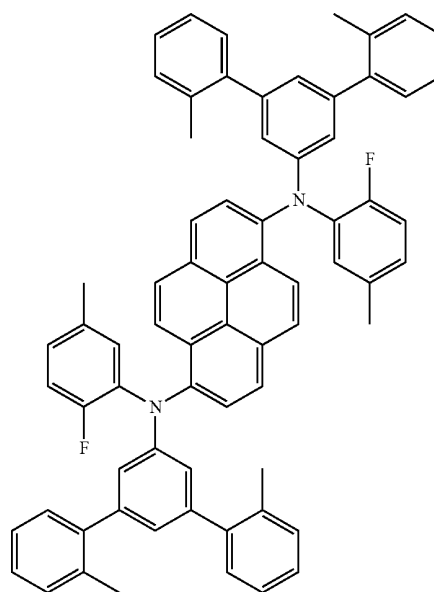
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BD 268

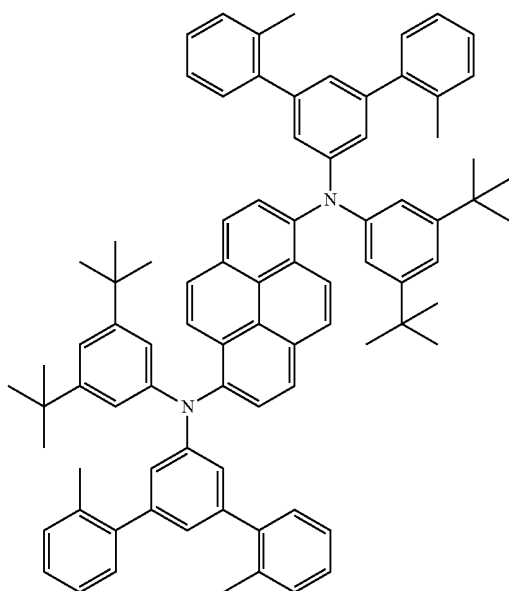


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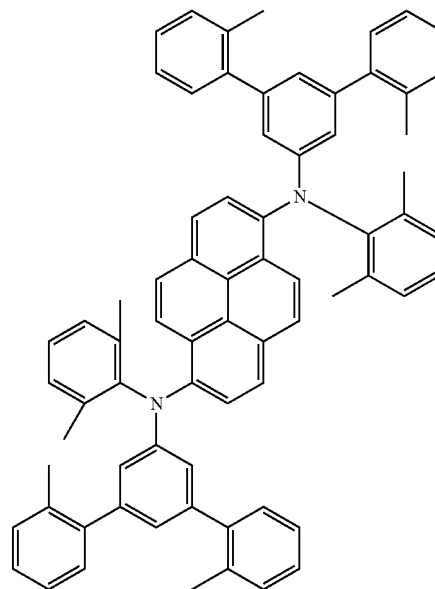
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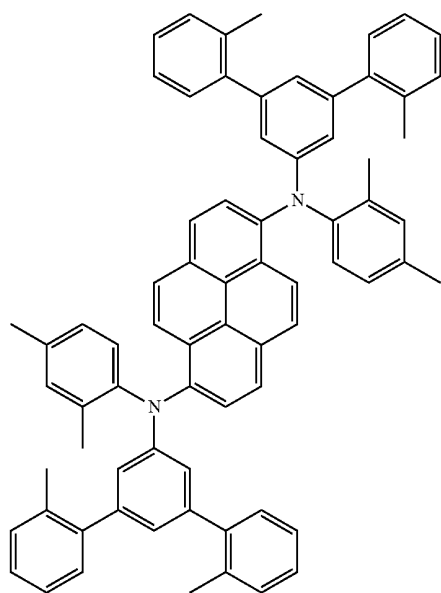


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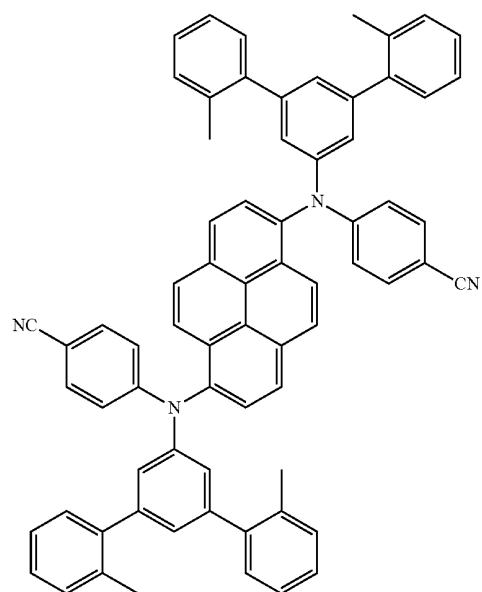
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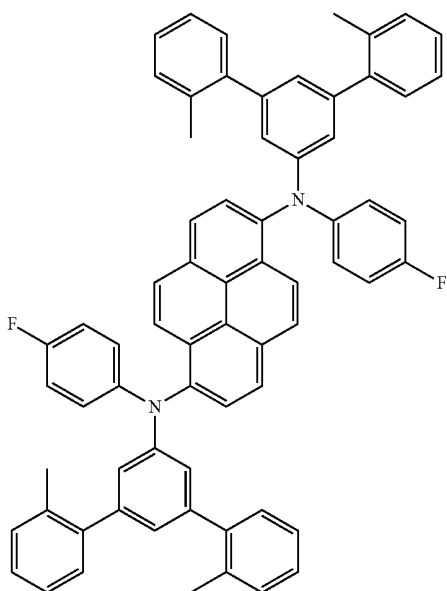


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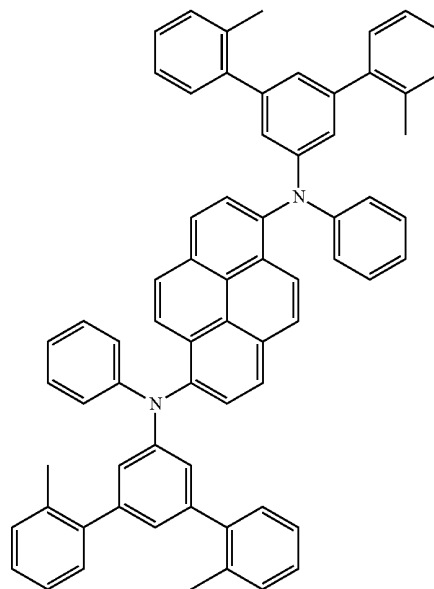
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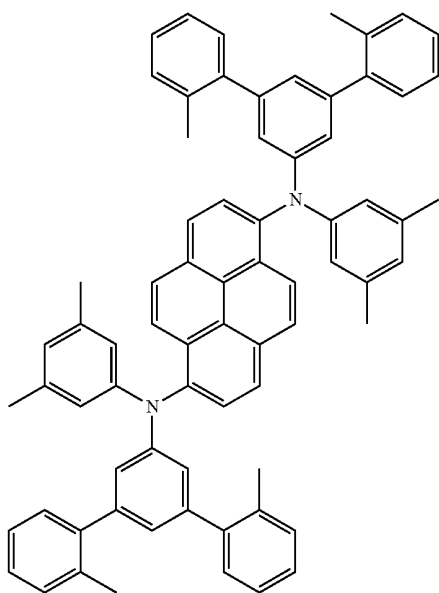


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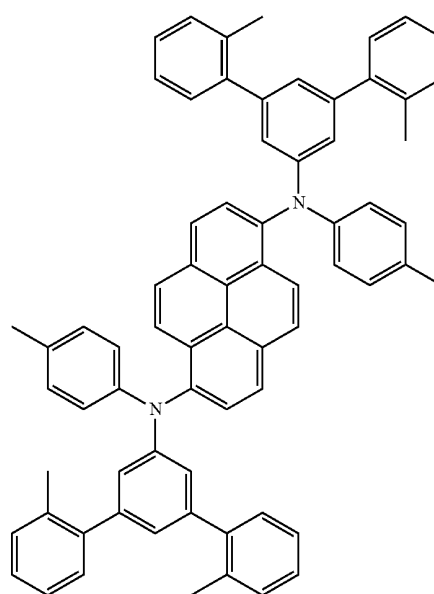
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BD 276

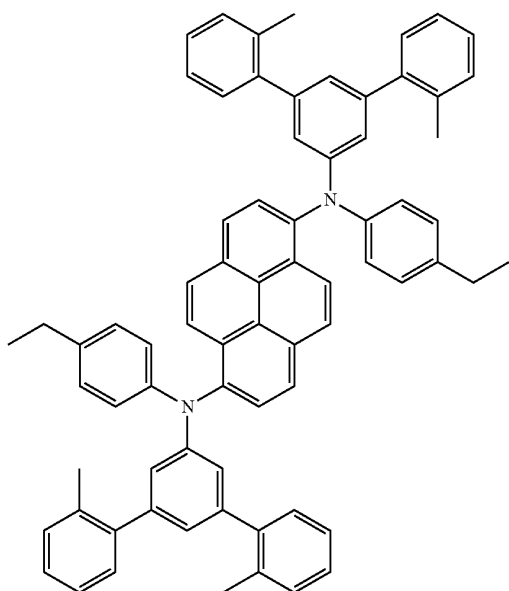


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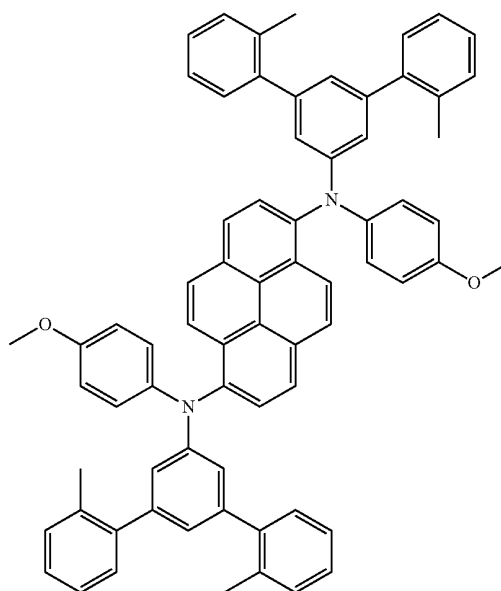
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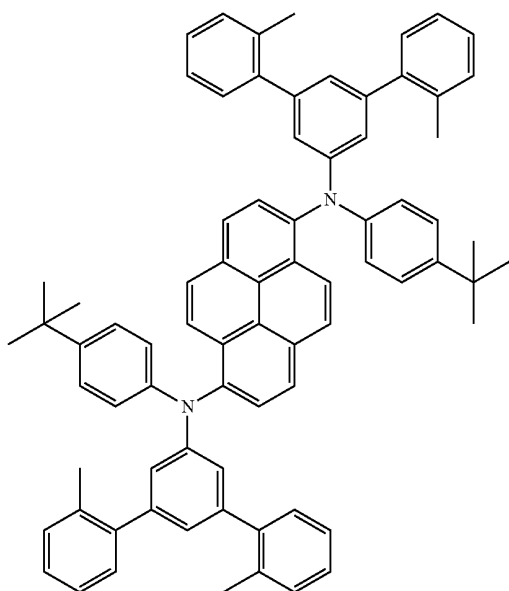


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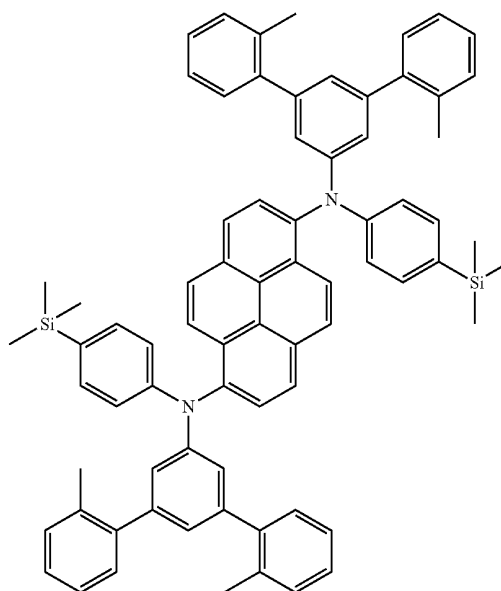
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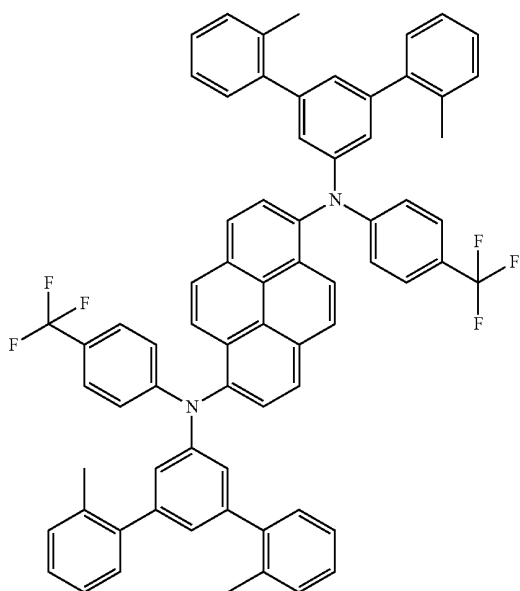


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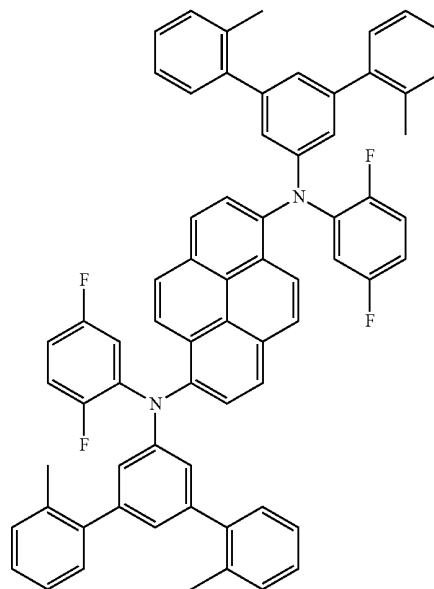
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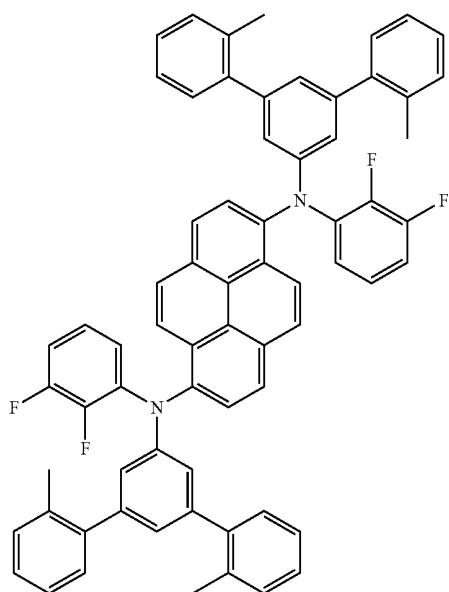


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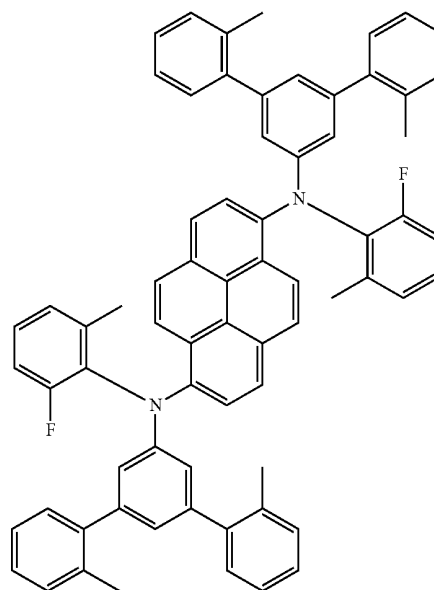
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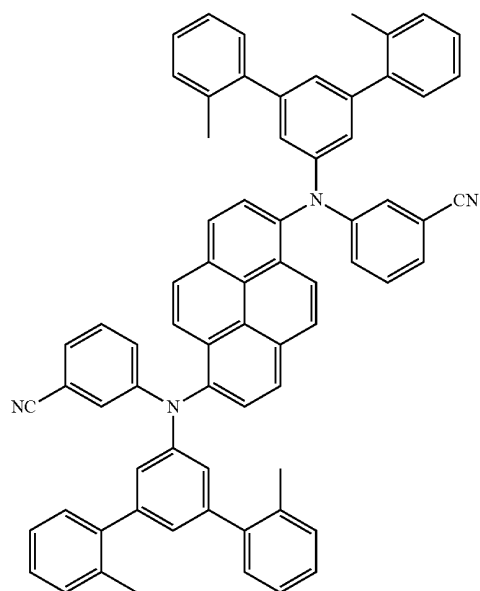


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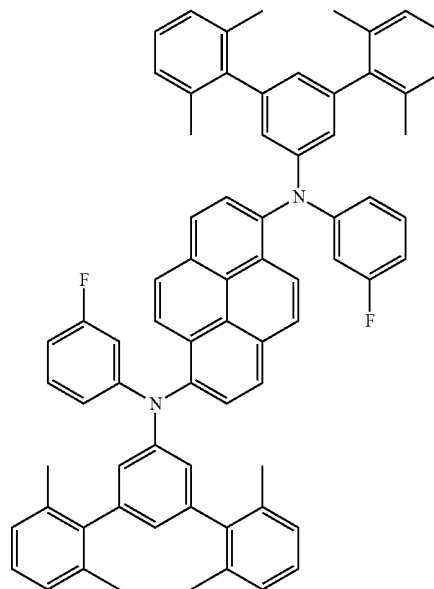
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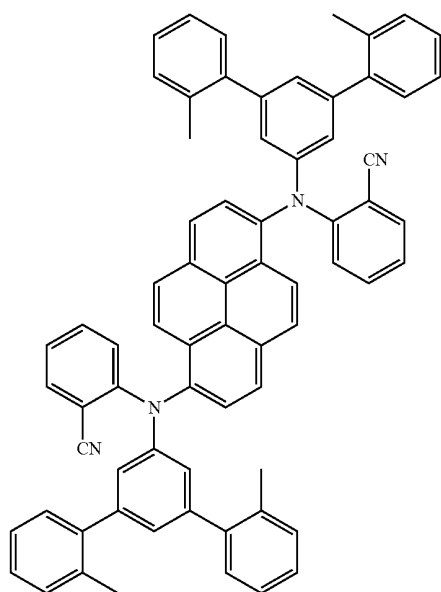


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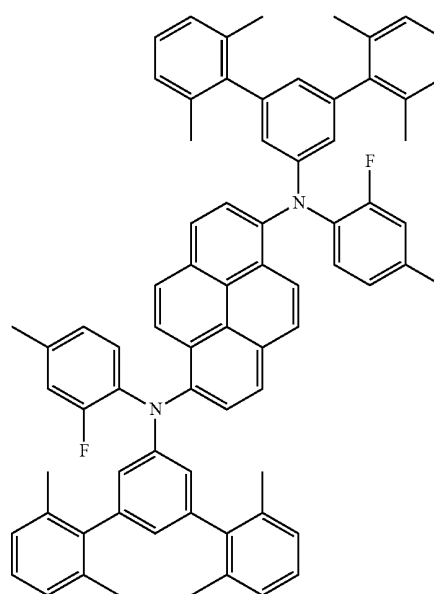
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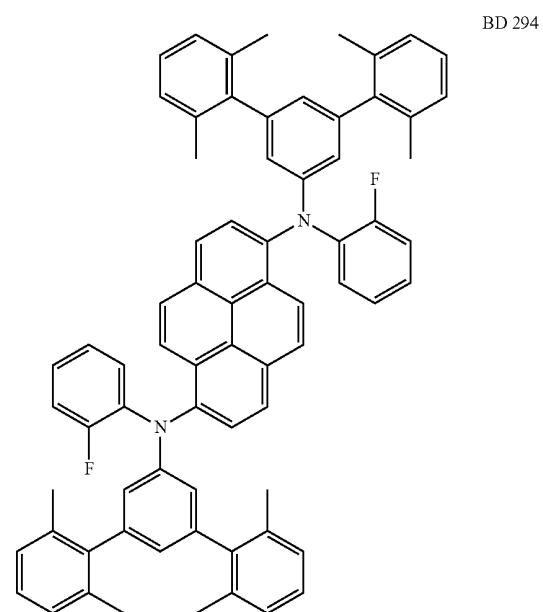
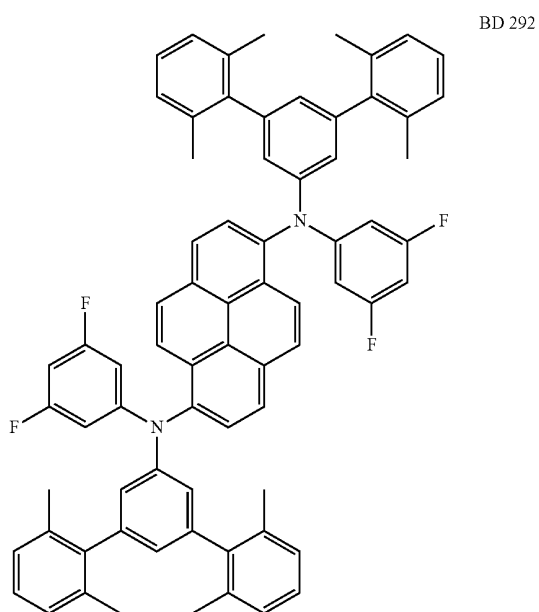
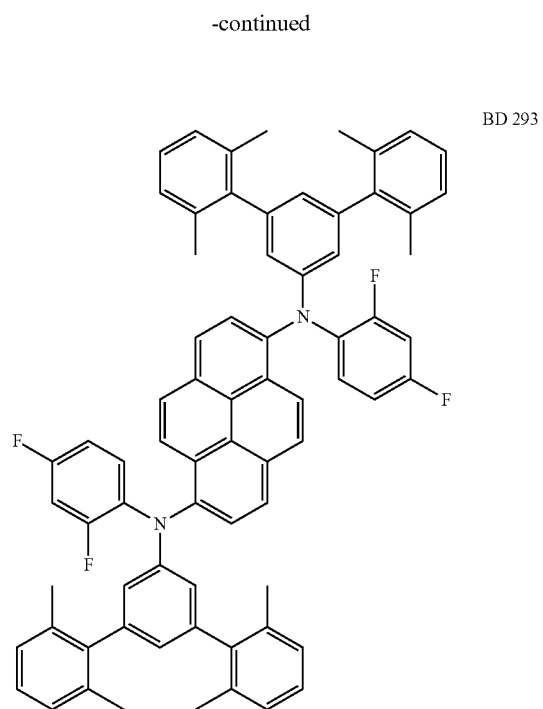
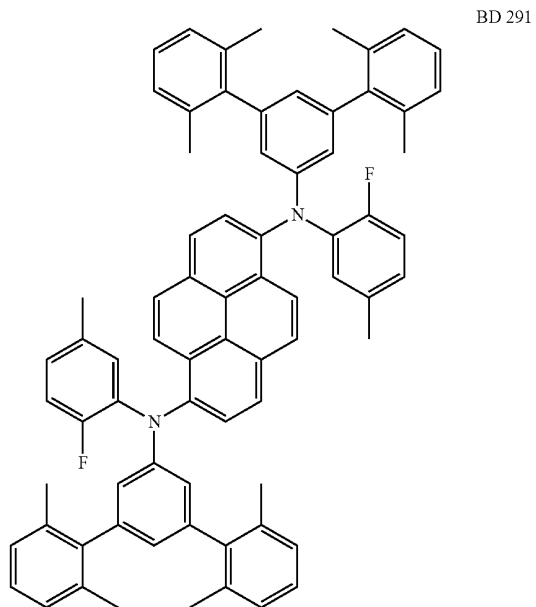
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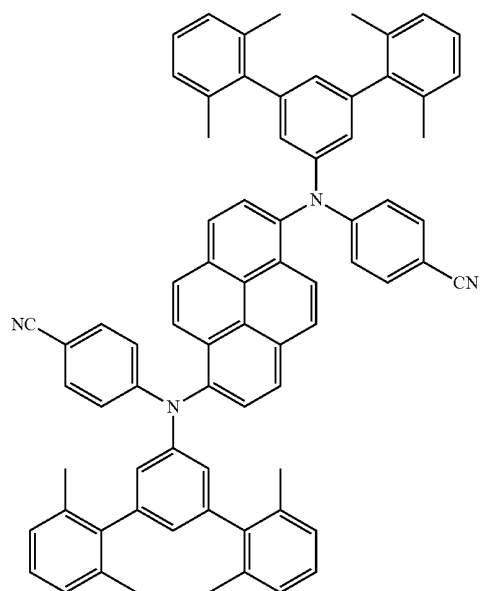


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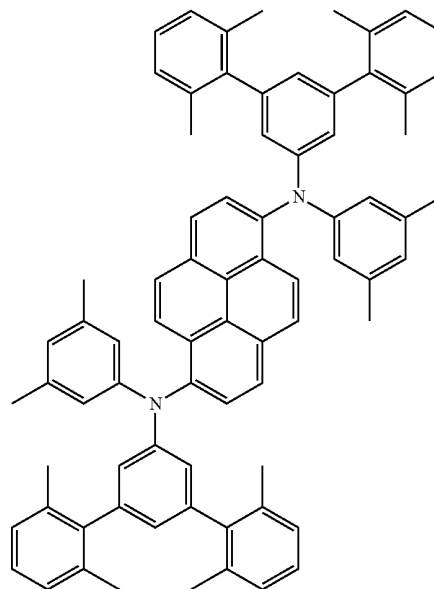
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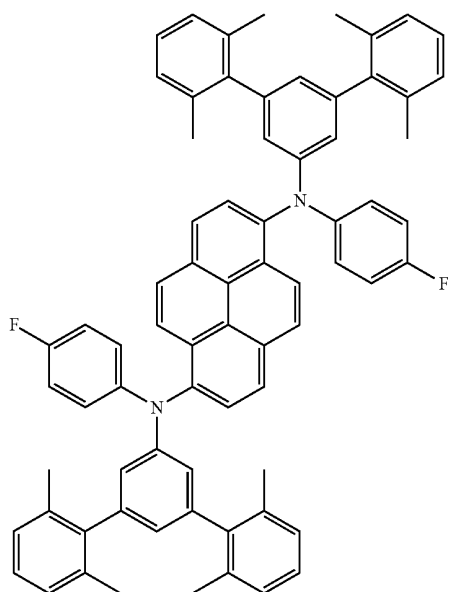


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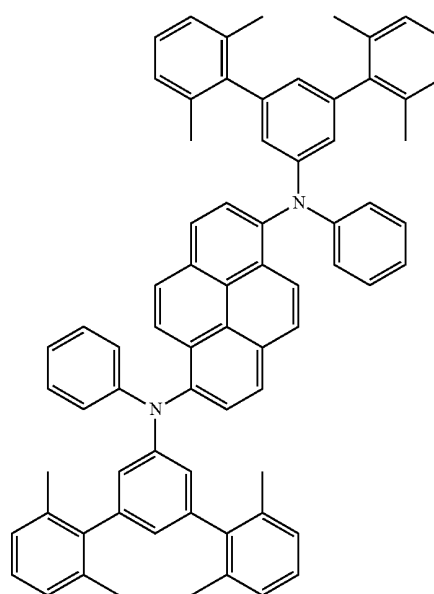
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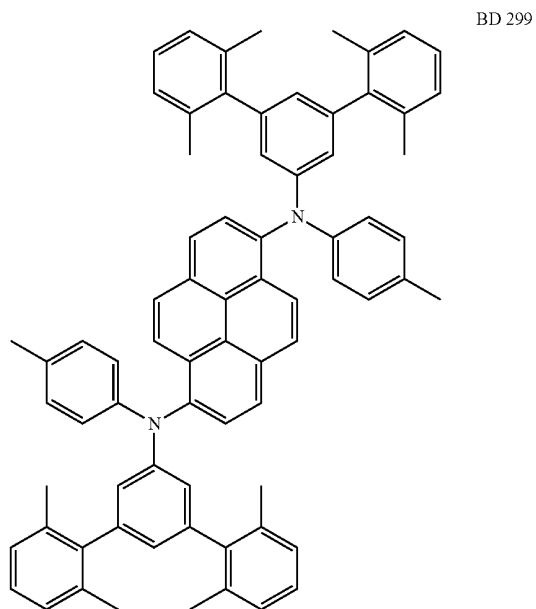
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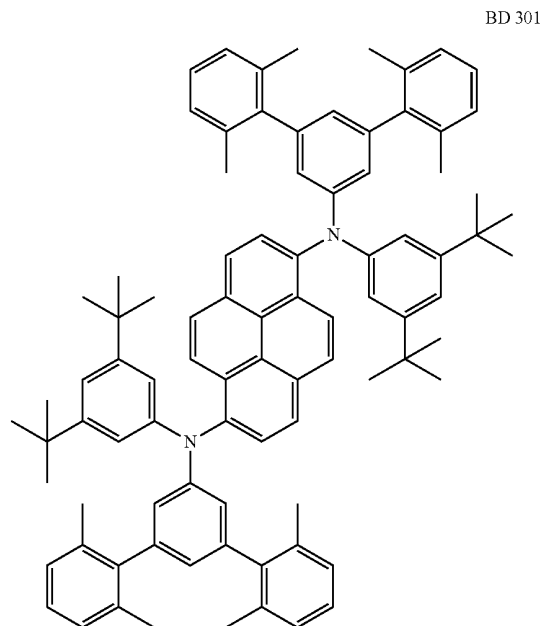
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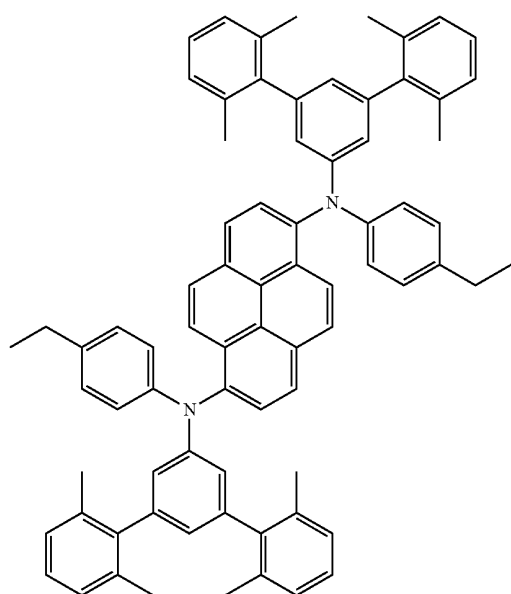
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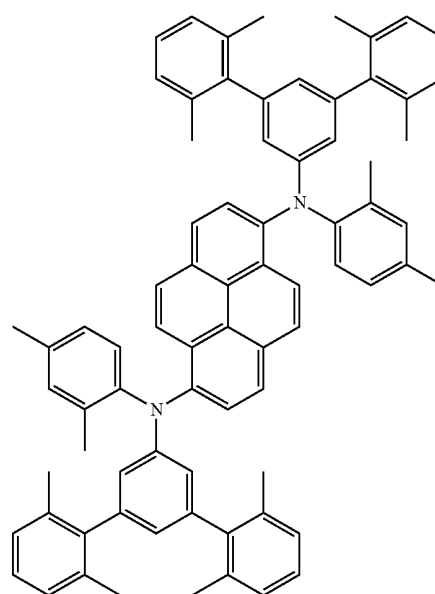
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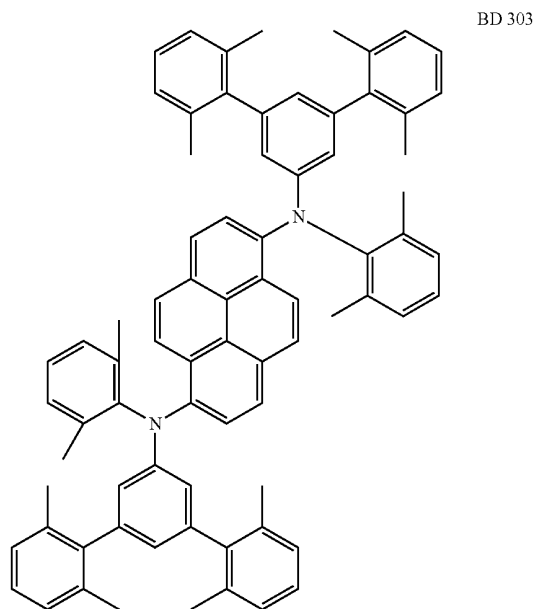
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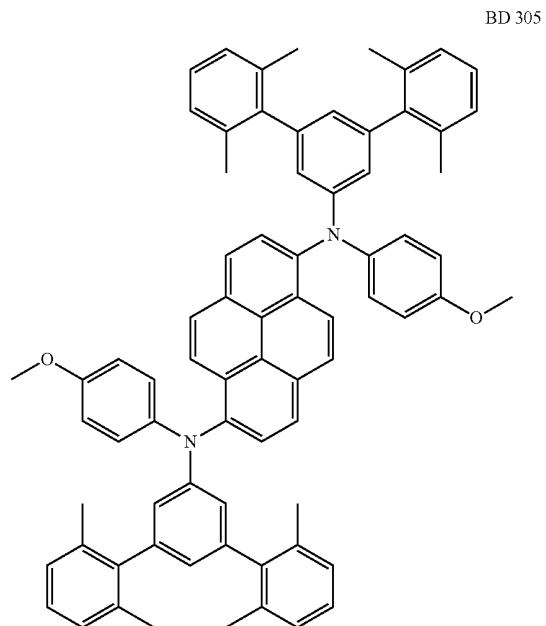
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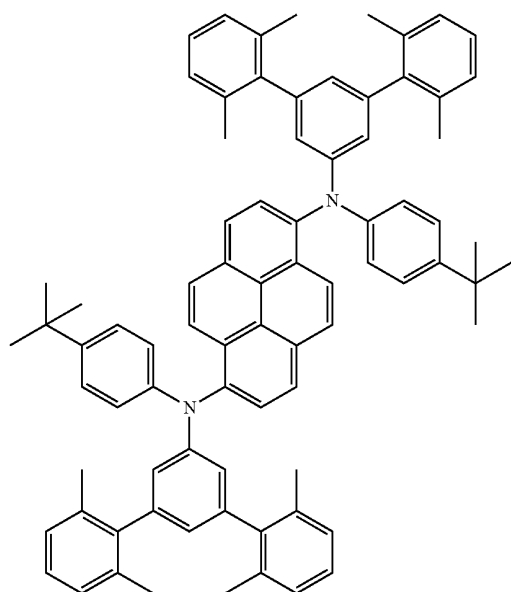
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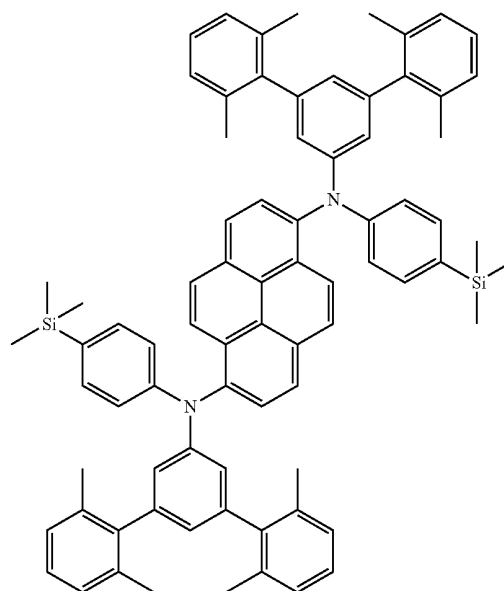
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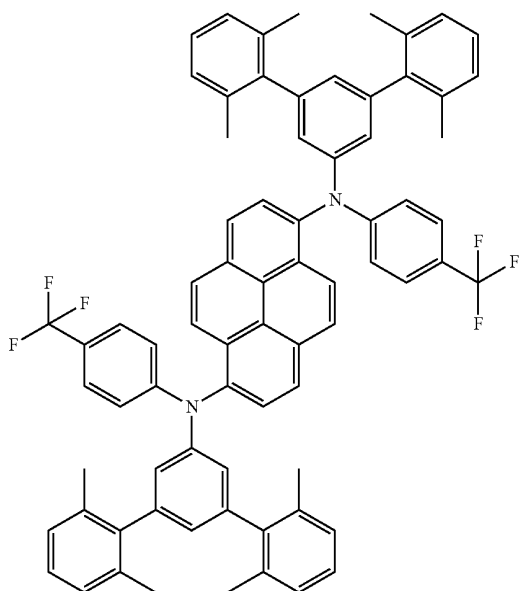


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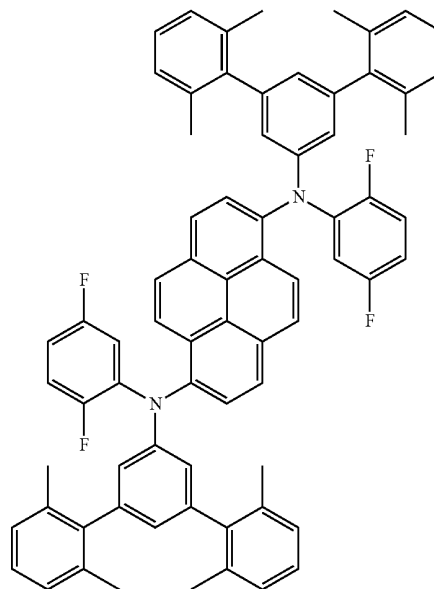
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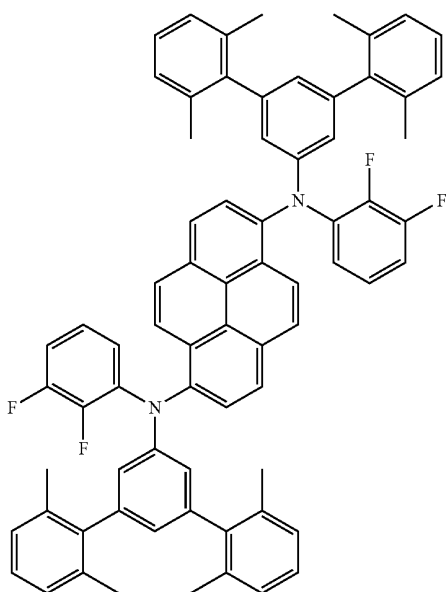


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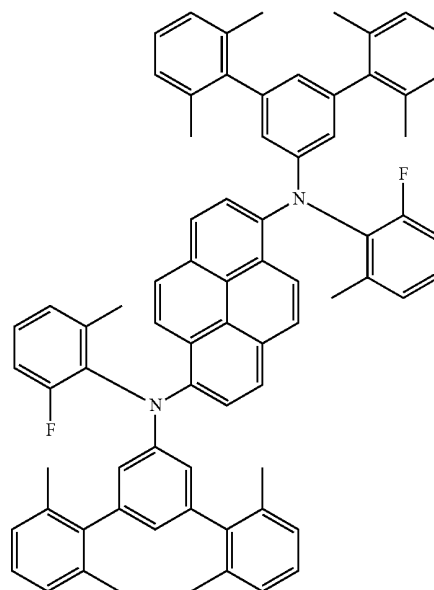
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BD 308

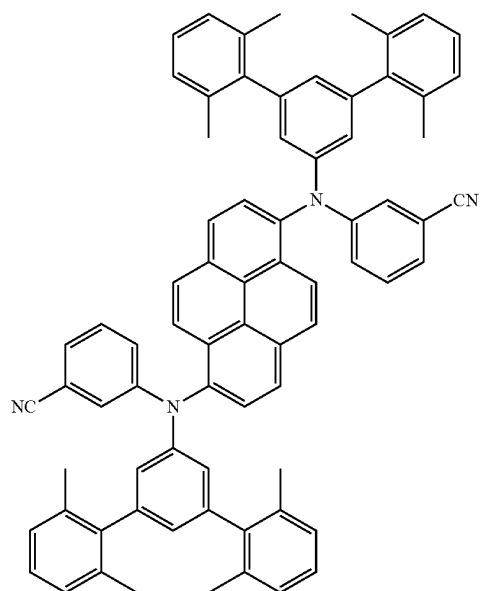


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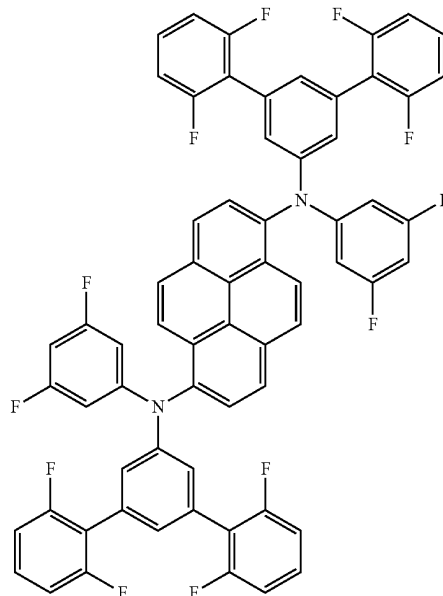
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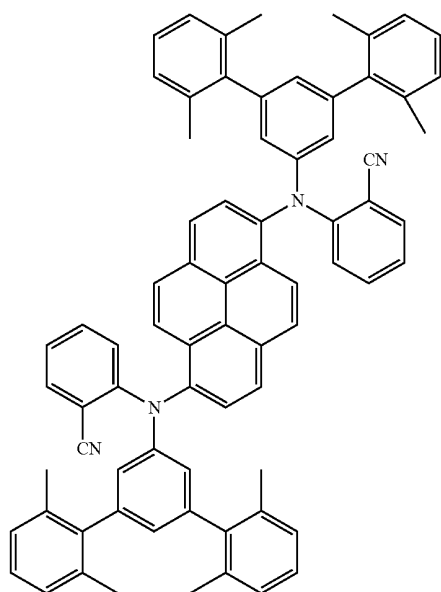


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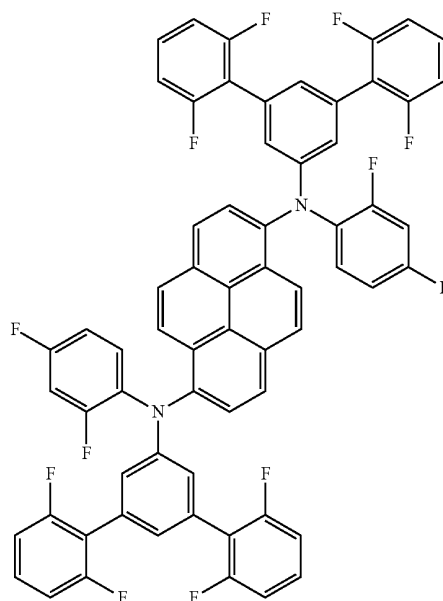
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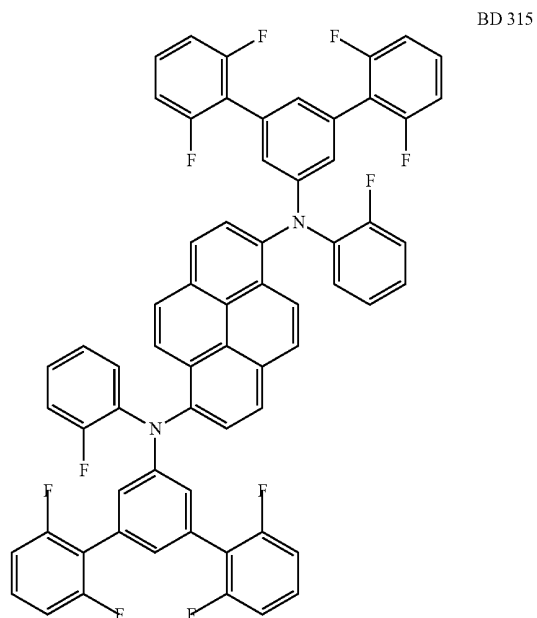
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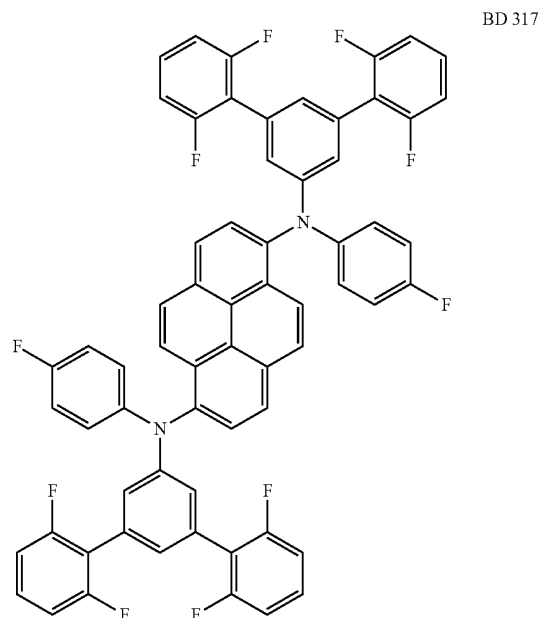
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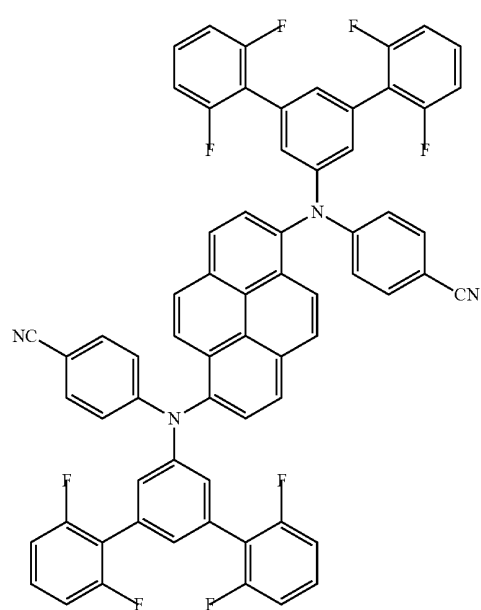
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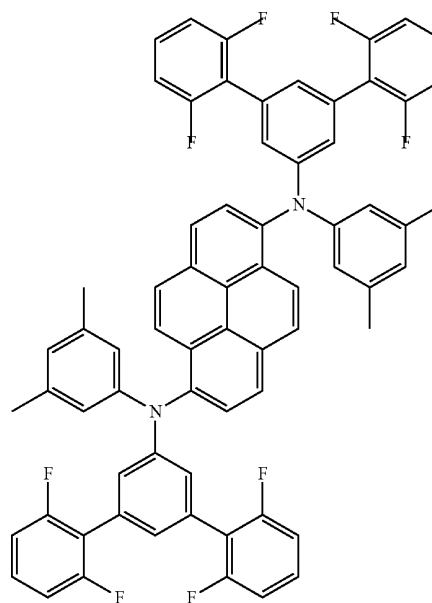
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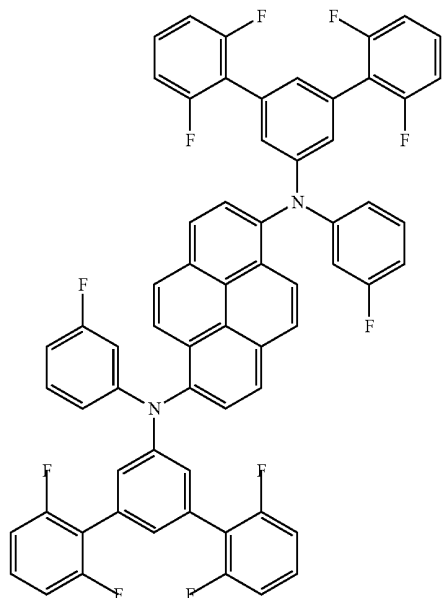


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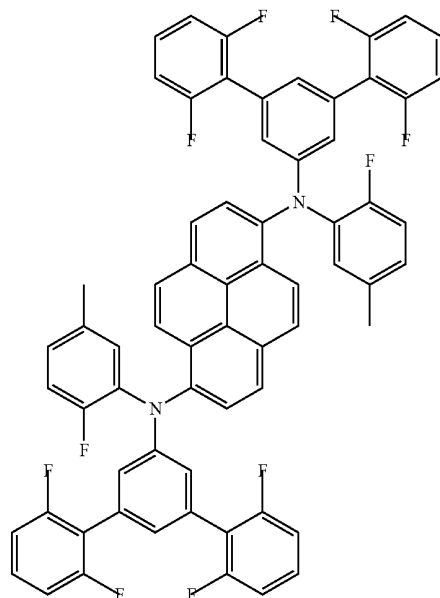
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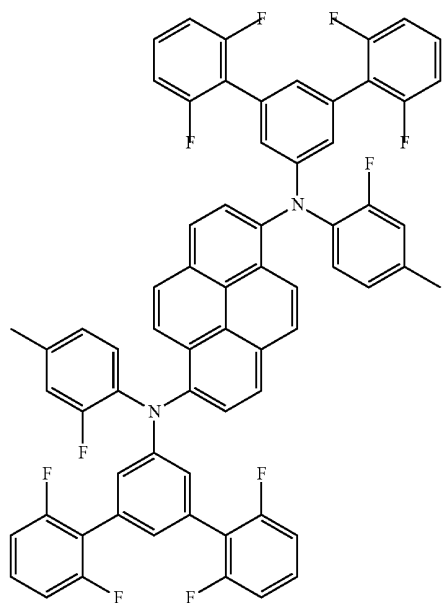


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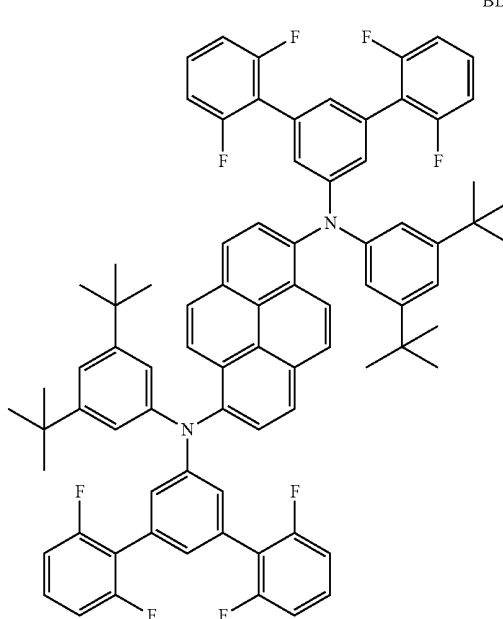
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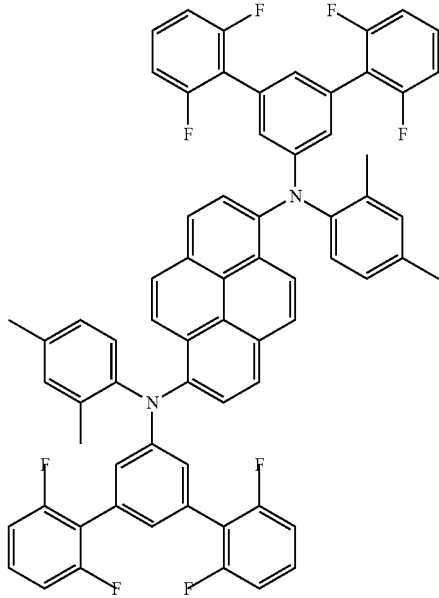
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BD 322

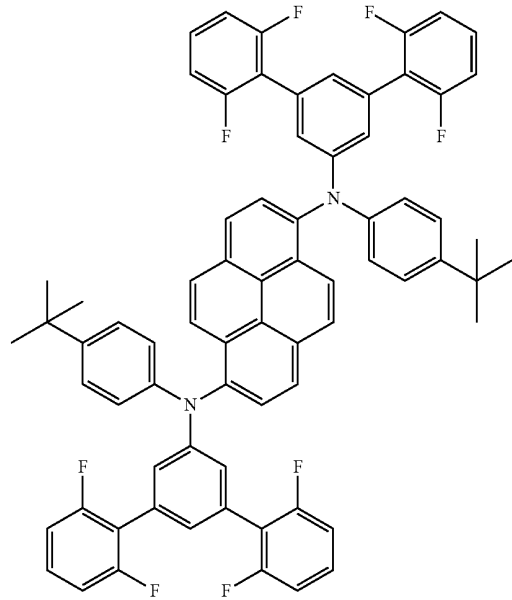


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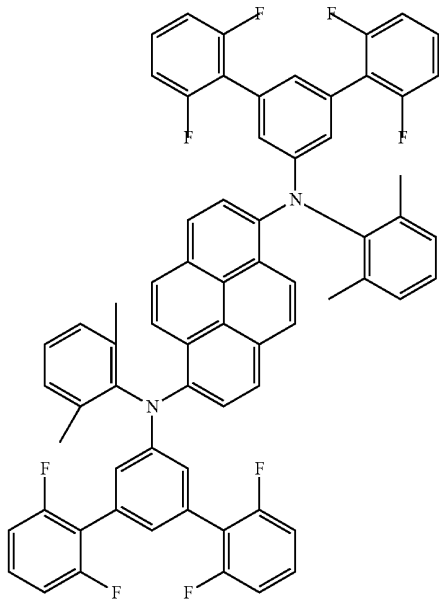


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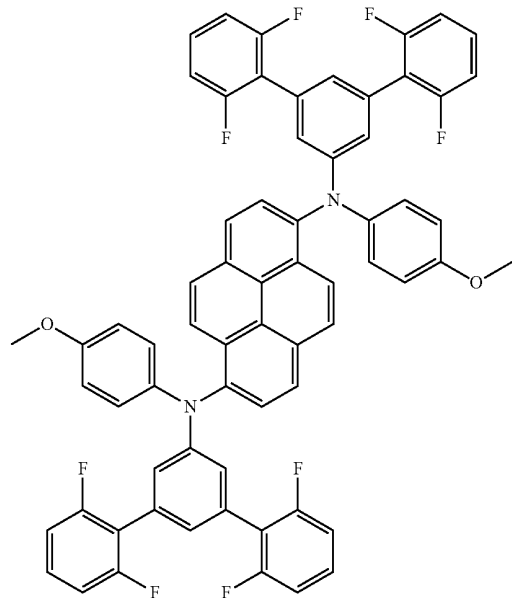
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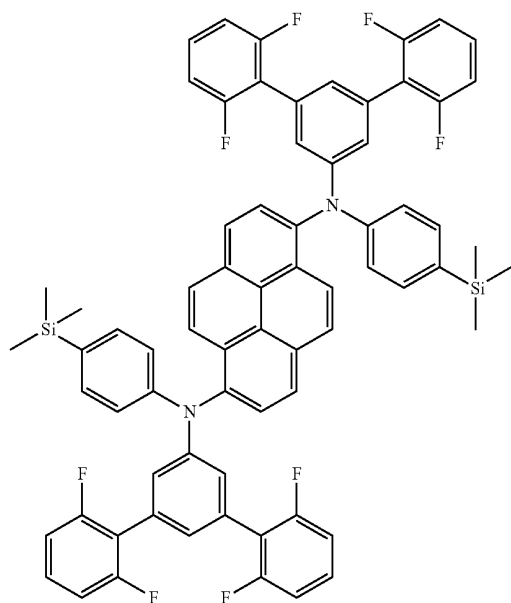
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BD 326

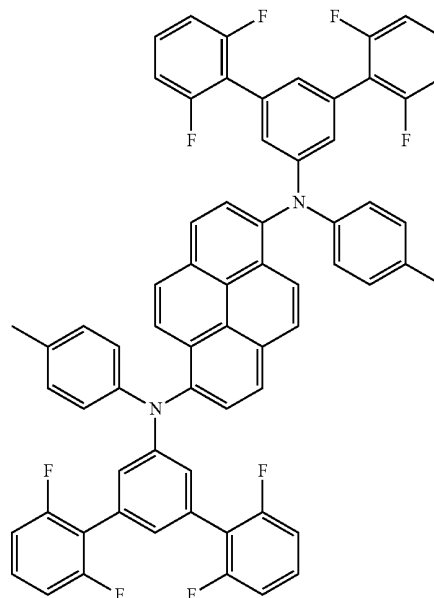
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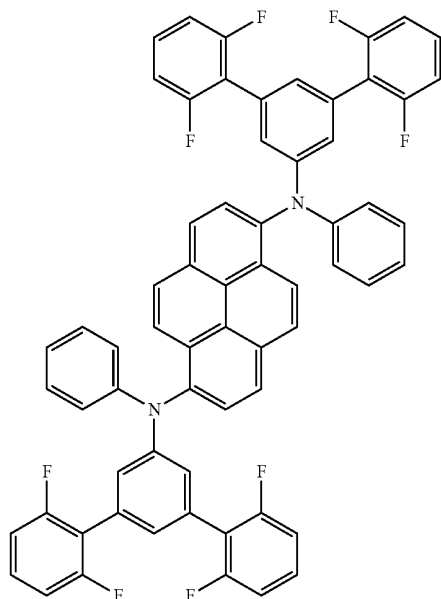


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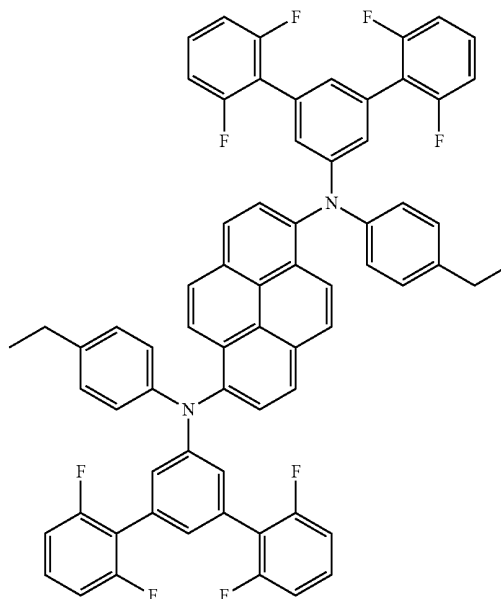
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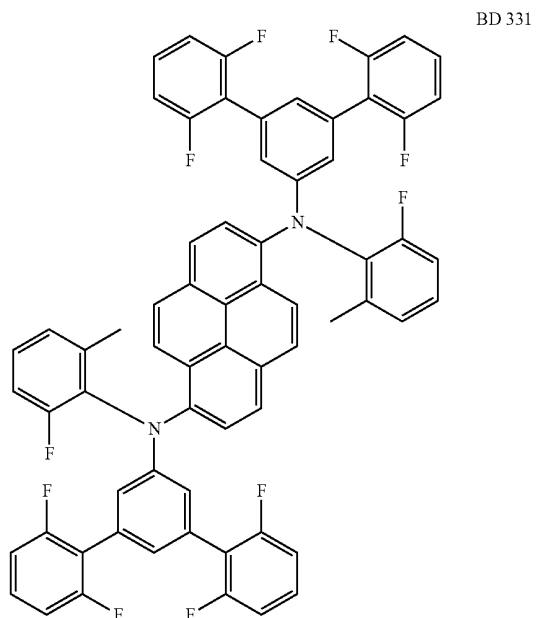
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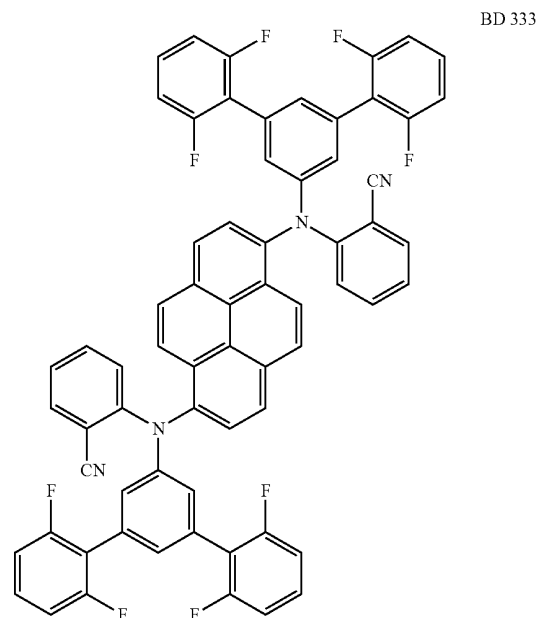
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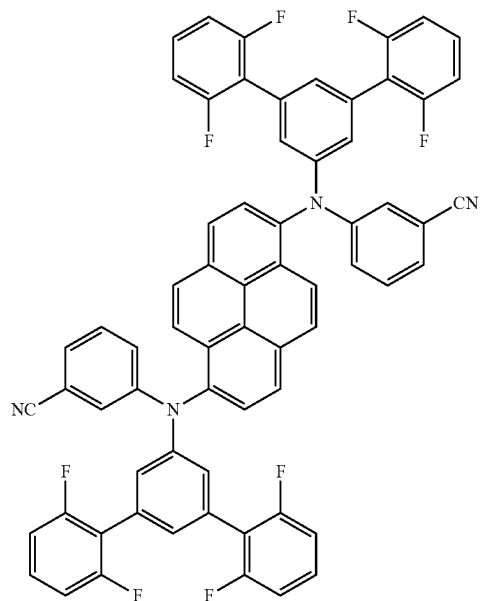
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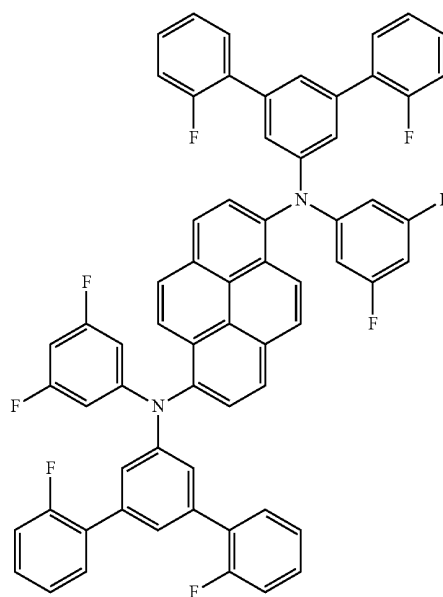
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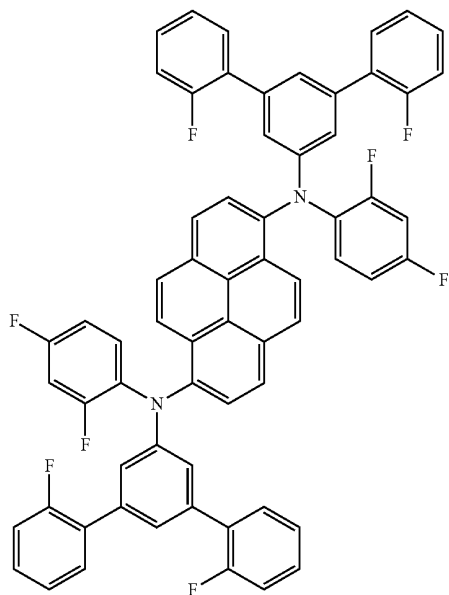
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BD 334

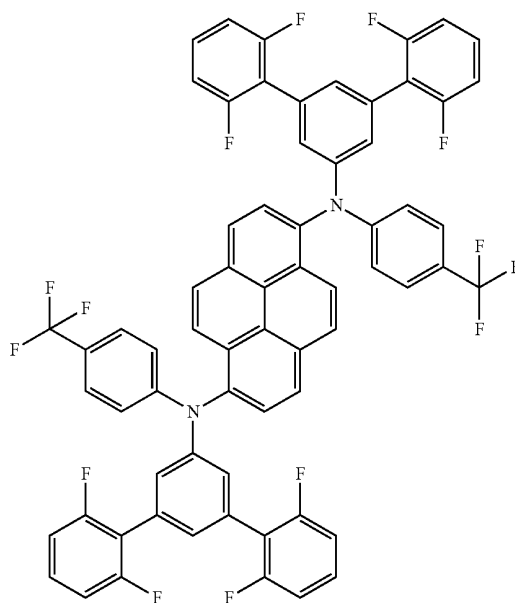


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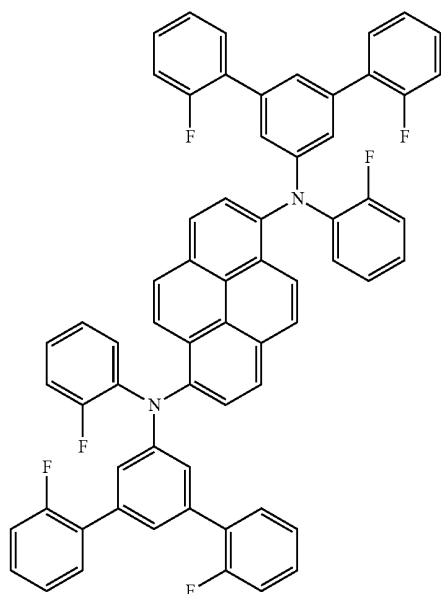
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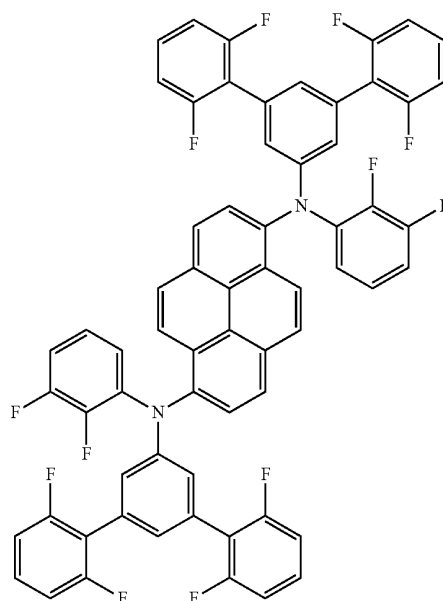


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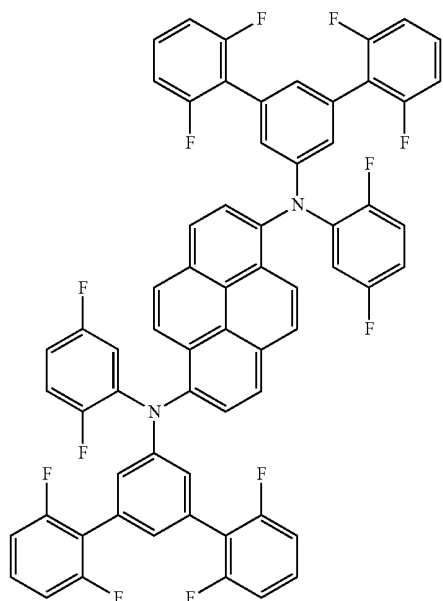
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BD 338

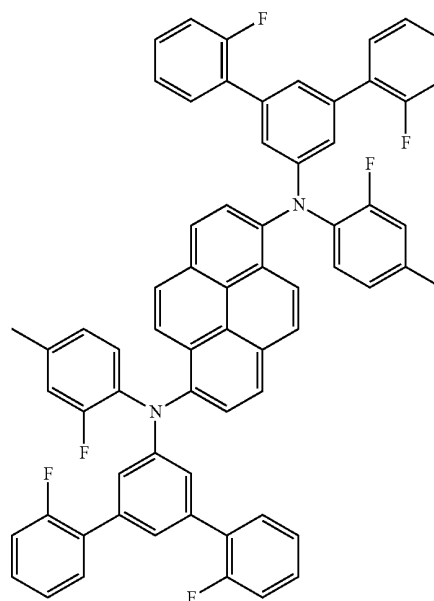


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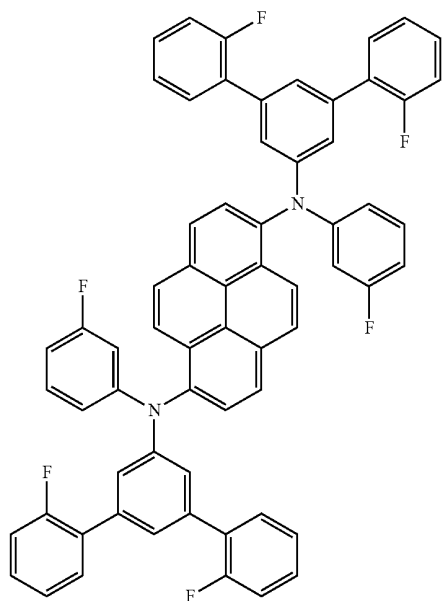
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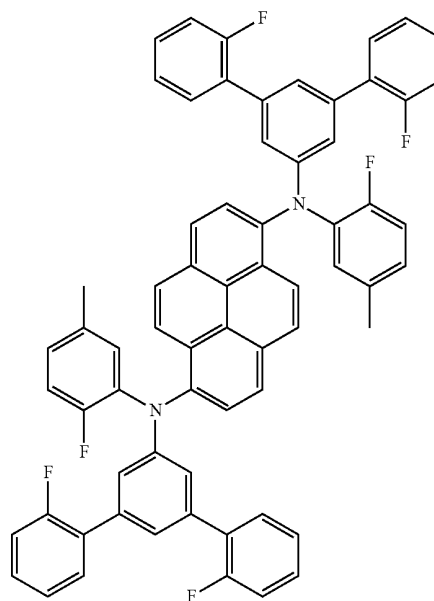


BD 341

BD 340

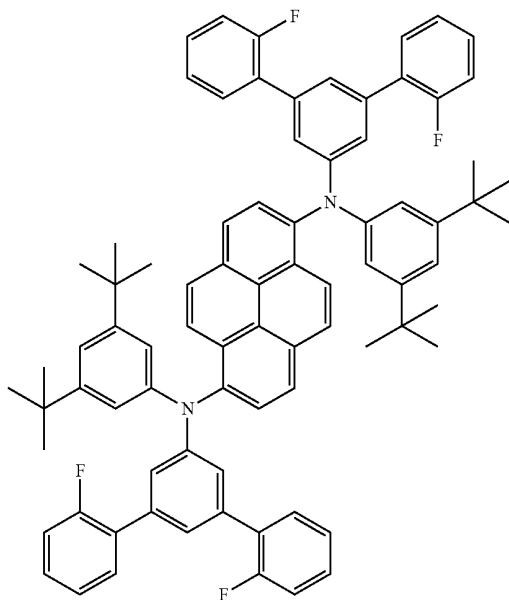


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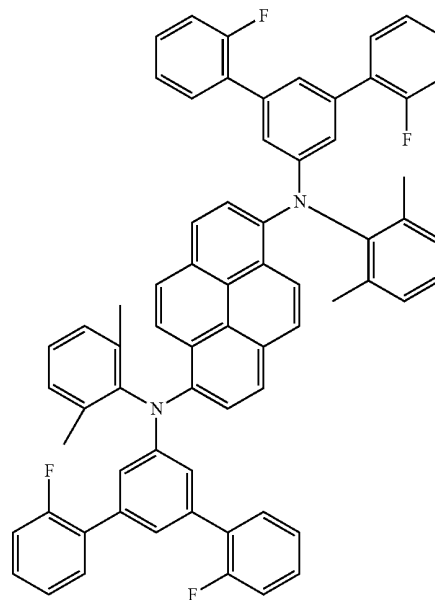
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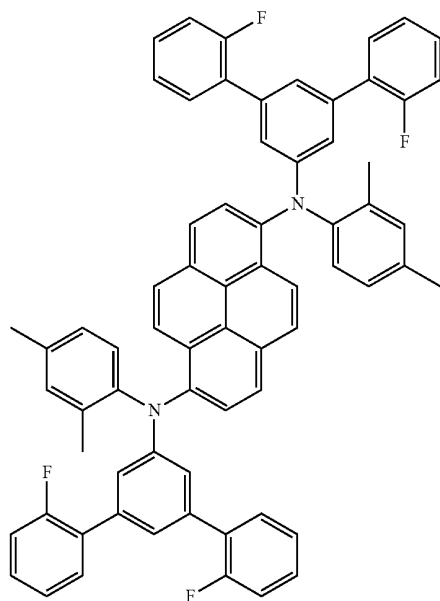


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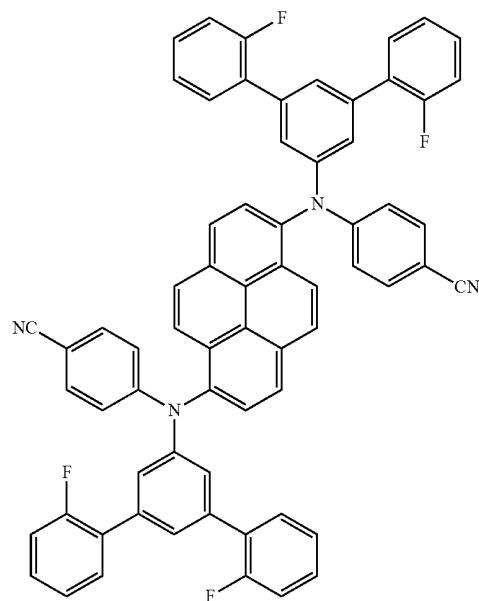
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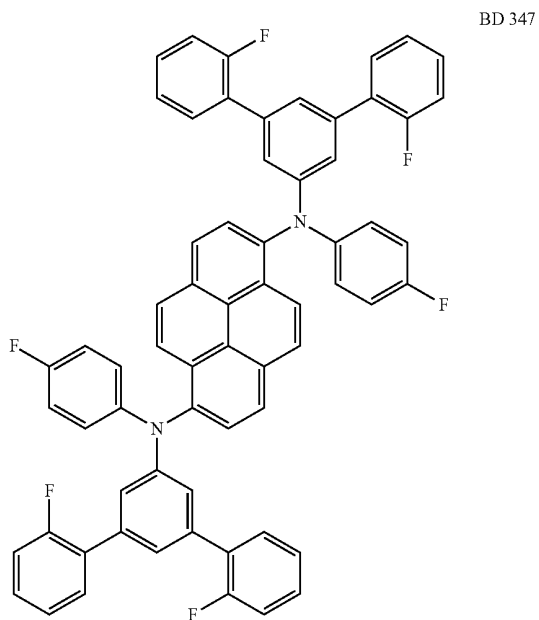
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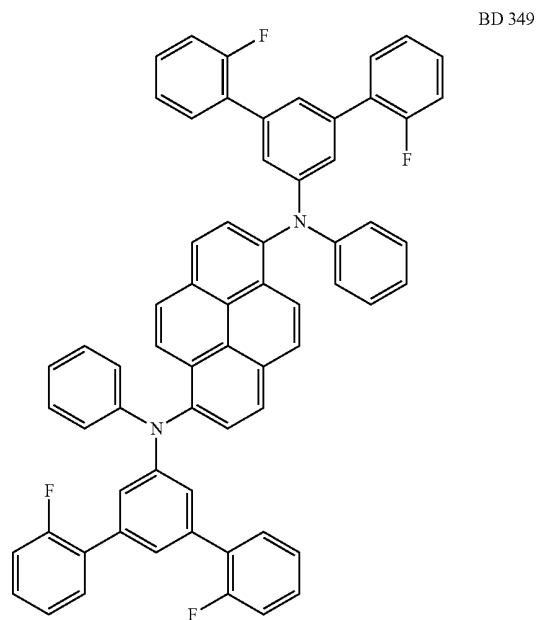
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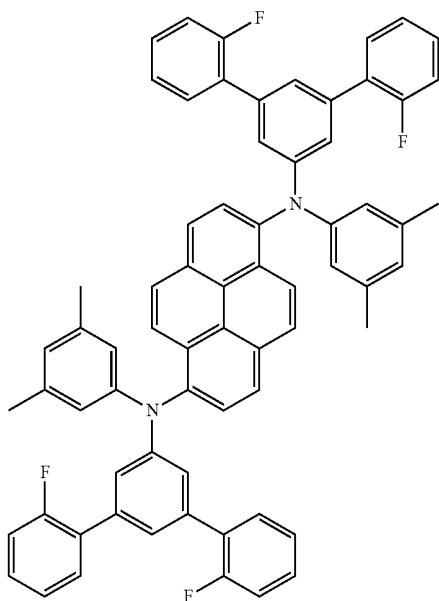
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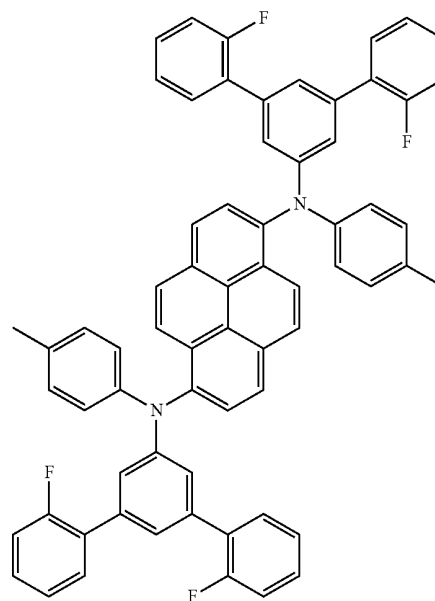
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BD 348

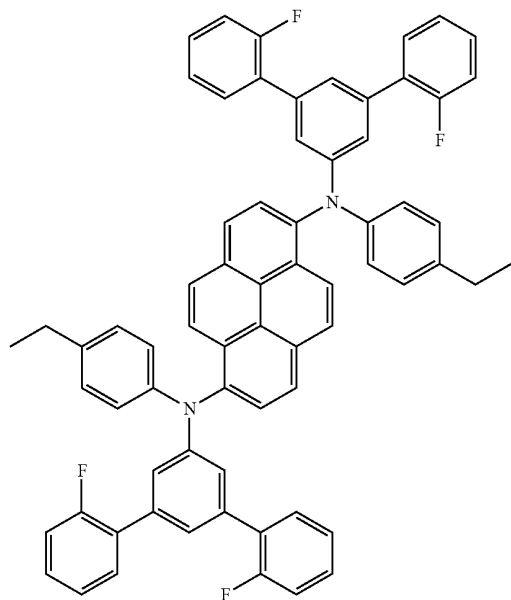


BD 350



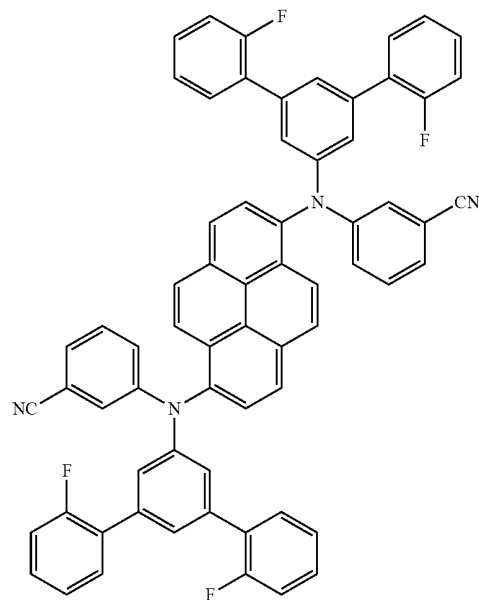
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BD 351

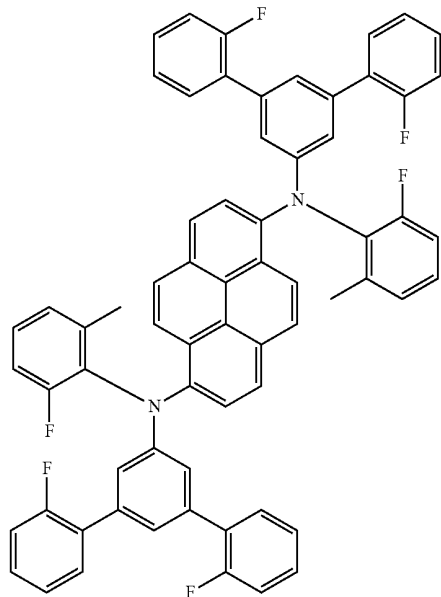


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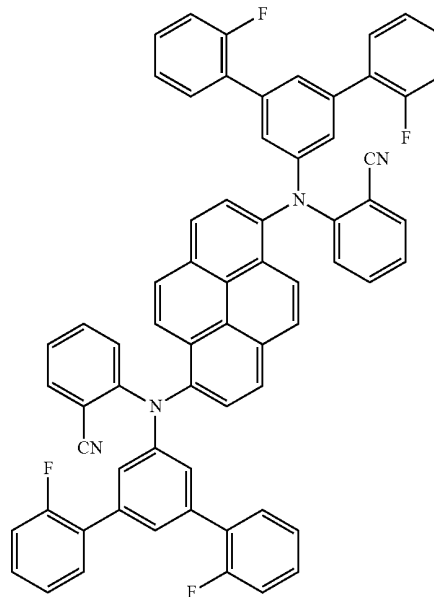
BD 353



BD 352

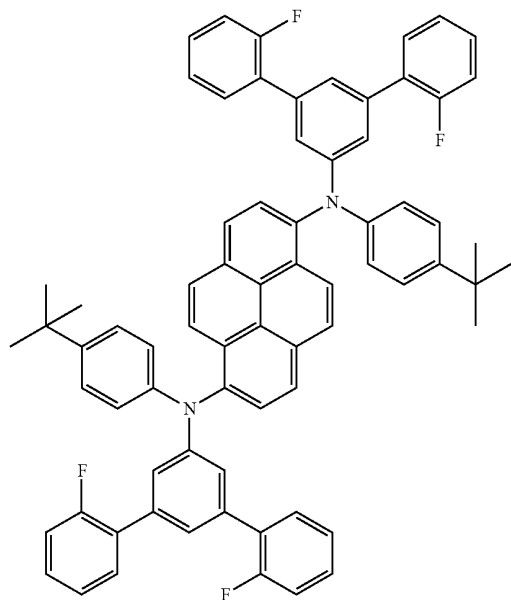


BD 354



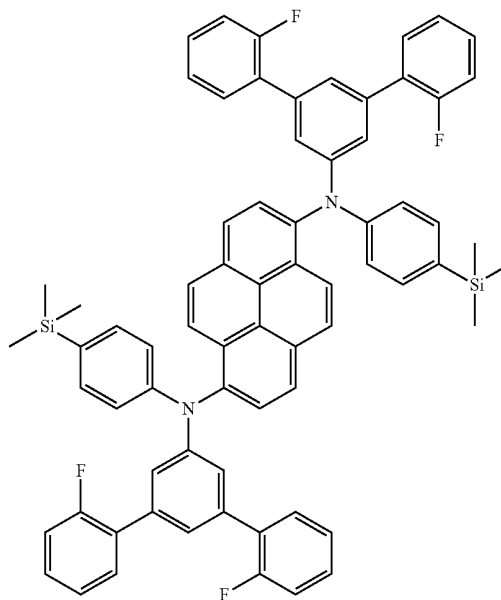
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BD 355

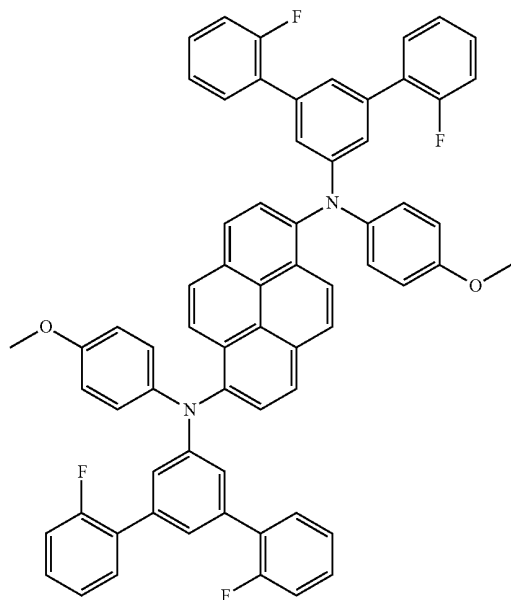


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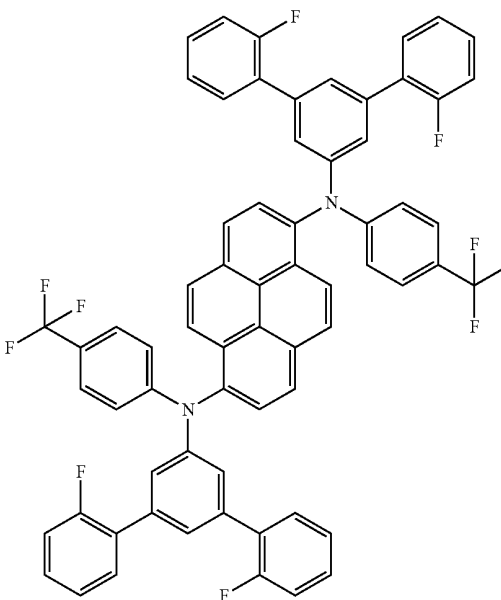
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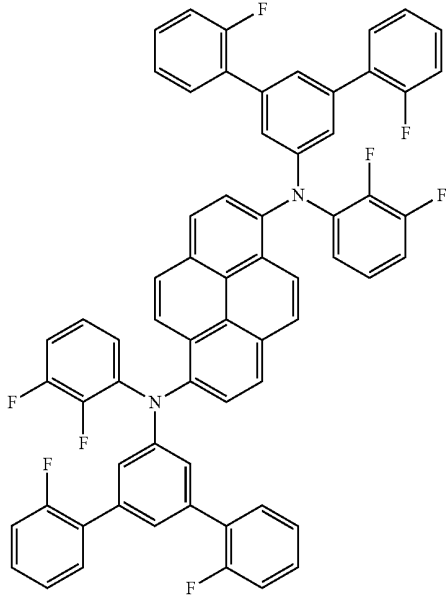
BD 356



BD 358



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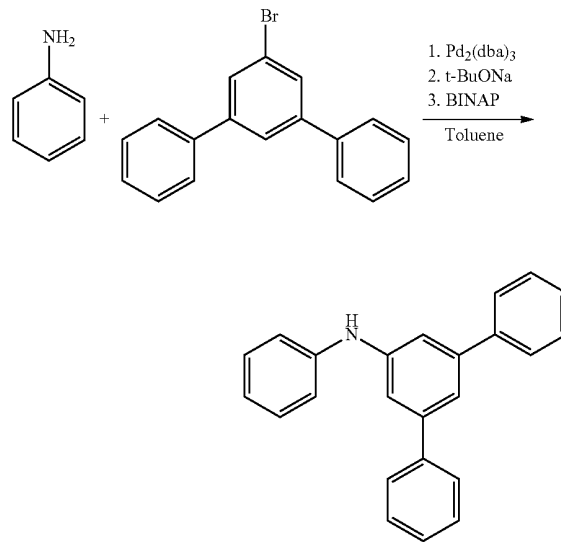


BD 359

[0033]

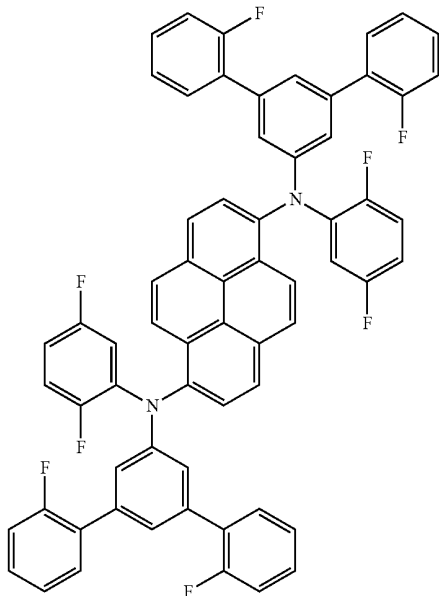
An Example of Compounding

1) Compounding N-Phenyl-3,5-diphenylaniline



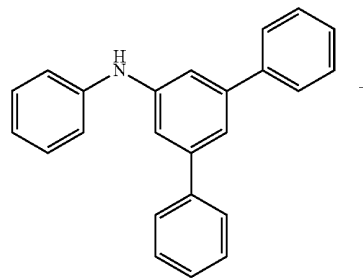
[0034] Aniline (3 g, 10.75 mmol), m-terphenyl (3.34 g, 10.85 mmol), Pd₂(dba)₃ (3 mol %), and t-BuONa (1.45 g, 15.05 mmol) is dissolved in toluene in a round flask, and a solution thereof is stirred at 100° C. Upon finishing reaction thereof, the toluene is removed from the solution, and a compound is extracted from the solution by using water and dichloromethane. The compound extracted thus is separated by using silica gel. The separated substance is re-crystallized by using dichloromethane and petroleum ether, and filtered, to obtain N-Phenyl-3,5-diphenylaniline (2.9 g, 84%).

BD 360



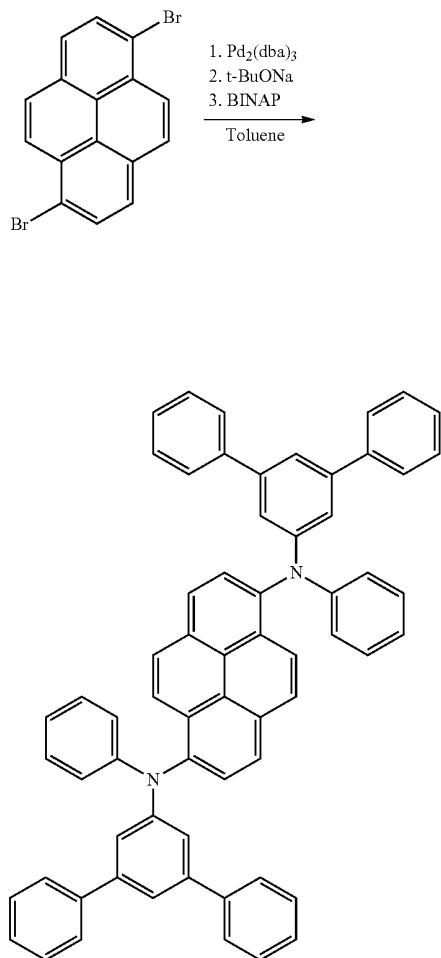
2) Preparation of 1,6-di(N-Phenyl-N-(m)-terphenyl)pyrene

[0035]



[0032] A method for preparing the blue fluorescence compound of the present invention will be described taking a compound having a chemical formula BD-10 among the blue fluorescence compounds of the present invention.

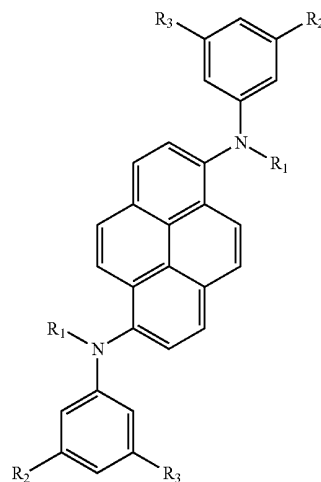
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[0036] 1.6 Dibromopyrene (1 g, 2.78 mmol), N-phenyl-3,5-diphenylaniline (1.87 g, 5.83 mmol), $\text{Pd}_2(\text{dba})_3$ (3 mol %), BINAP (4 mol %), and $t\text{-BuONa}$ (0.78 g, 8.16 mmol) is dissolved in toluene in a round flask, and a solution thereof is stirred at 100°C . Upon finishing reaction thereof, the toluene is removed from the solution by using water and dichloromethane. The compound extracted thus is separated by using silica gel. The separated substance is re-crystallized by using dichloromethane and petroleum ether, and filtered, to obtain 1,6 di(N-phenyl-N-(m-terphenyl)pyrene (BD-10; 4.27 g, 87%).

[0037] Referring to FIG. 1, the organic electroluminescence device **130** of the blue fluorescence compound of the present invention includes an anode **132**, a cathode **138**, and an electroluminescence layer formed between the anode **132** and the cathode **138** to have a host substance and a dopant substance. The dopant substance in the electroluminescence layer has the following chemical formula 1.

[Chemical Formula 1]



[0038] Where, each of R1, R2, and R3 are one of substances selected from aromatic groups, a heterocyclic, an aliphatic group and hydrogen which is substituted or not substituted, independently. The R1, R2, and R3 may or may not be identical substances.

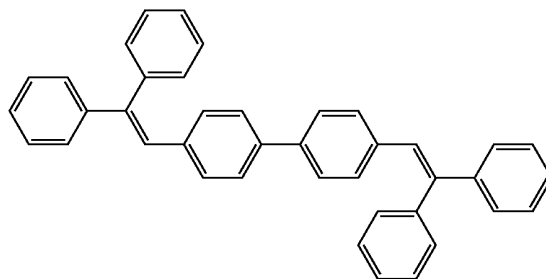
[0039] In detail, the R1, R2, and R3 may be one of substances selected from the aromatic group including phenyl, biphenyl, naphthyl, phenanthrene, terphenyl, pyridine, quinoline, and deuterium, or a substituent thereof.

[0040] Or, each of the R1, R2, and R3 may be one of substances selected from aromatic compound having alkyl, alkoxy, halogen, cyano, and silyl groups.

[0041] The alkyl group is one selected from methyl, propyl, isopropyl, and t-butyl, and the alkoxy group is one selected from methoxy, ethoxy, and butoxy. The halogen group is one selected from fluorine and chlorine, and the silyl group may be trimethylsilyl.

[0042] In detail, the dopant substance of the electroluminescence layer **135** may be one of compounds having the following chemical formulae BD-1 to BD-360. However, the dopant substances are not limited to those. The host substance which forms the electroluminescence layer together with the dopant substance selected from BD-1 to BD-360 may be 4,4'-bis(2,2-diphenyl)-1,1' biphenyl(4,4'-bis(2,2-diphenylvinyl)-1,1'-biphenyl; DPVBi). However, the host substances are not limited to those, but any known substance may be used.

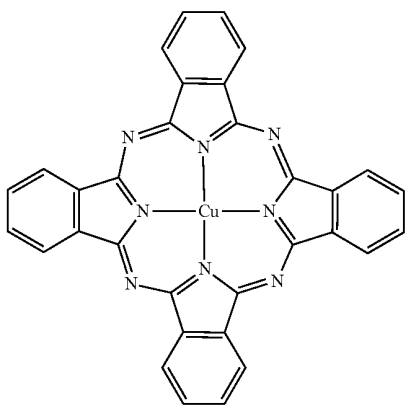
[Chemical Formula 2]



[0043] The organic electroluminescence device **130** may include a hole injection layer HIL **133** and a hole transport layer HTL **134** between the anode **132** and the electroluminescence layer **135**, or an electron transport layer ETL **136** and an electron injection layer EIL **137** between the electroluminescence layer **135** and the cathode **138**, additionally.

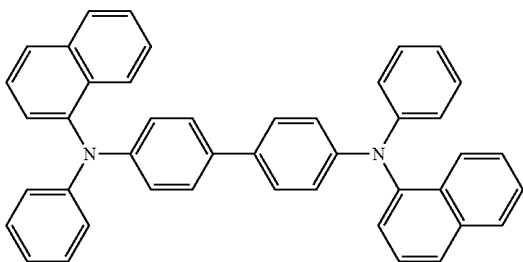
[0044] The anode **132** may be formed of ITO (Indium tin oxide) usually, and the hole injection layer **133** may be formed of copper phthalocyanine CuPc which has the following chemical formula 3 mainly.

[Chemical Formula 3]



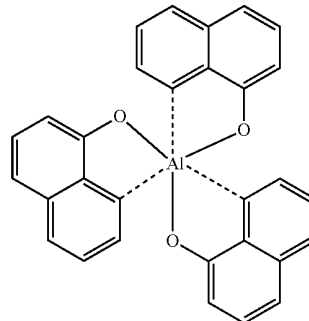
[0045] The hole transport layer **134** may be formed of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]-biphenyl NPB having the following chemical formula 4. However, the material of the hole transport layer **134** is not limited this, but may be any known hole transport substance.

[Chemical Formula 4]



[0046] The electron transport layer **136** may be formed of 8-hydroxy-quinolate tris(8-hydroxy-quinolate)aluminum Alq₃ having the following chemical formula 5. However, the material of the electron transport layer **136** is not limited this, but may be any known electron transport substance.

[Chemical Formula 5]



[0047] The electron injection layer **137** may be formed of LiF. However, the material of the electron injection layer **137** is not limited this, but may be any known electron injection substance. The cathode **138** may be formed of any known metal.

[0048] By using a blue fluorescent compound selected from the BD-1 to BD-360 as the dopant substance of the electroluminescence layer **135** of the organic electroluminescence device **130**, the present invention permits to obtain a blue fluorescent organic electroluminescence device having high light emission efficiency, an excellent heat resistance, a long lifetime and high color purity.

[0049] In a method for fabricating an organic electroluminescence device of the blue fluorescent substance of the present invention, an anode is formed on a substrate, and a cathode is formed after forming a hole injection layer, a hole transport layer, an electroluminescence layer, an electron transport layer, and an electron injection layer on the anode in succession. In this instance, the electroluminescence layer includes a host substance and a dopant substance. The dopant substance of the electroluminescence layer may be a compound having above chemical formula 1, and in detail, a compound selected from compounds of BD-1 to BD-360.

[0050] The host substance may be DPVBi having above chemical formula 2, and the hole injection layer may be formed of CuPC having above chemical formula 3. The hole transport layer may be formed of NPB having above chemical formula 4, the electron transport layer may be formed of Alq₃ having above chemical formula 5, and the electron injection layer may be formed of LiF. The cathode may be formed of a known metal, such as aluminum Al.

[0051] However, materials of the hole injection layer, the hole transport layer, the electron transport layer, and the electron injection layer are not limited to above, but may be any known hole injection layer substance, any known hole transport layer substance, any known electron transport layer substance, and any known electron injection layer substance.

[0052] In the method for fabricating an organic electroluminescence device, by using a blue fluorescent compound selected from the BD-1 to BD-360 as the dopant substance, the present invention permits to obtain a blue fluorescent organic electroluminescence device having high light emission efficiency, an excellent heat resistance, a long lifetime and high color purity.

[0053] Embodiments of a method for fabricating an organic electroluminescence device of a blue fluorescent compound of the present invention will be described. However, the present invention is not limited to the following embodiments.

Embodiment 1

[0054] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of 1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-4 (5%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 616 cd/m² (5.82V) at 0.9 mA with CIE x=0.143, y=0.101.

Embodiment 2

[0055] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of 1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-18 (5%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 682 cd/m² (6.03V) at 0.9 mA with CIE x=0.146, y=0.110.

Embodiment 3

[0056] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of 1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-24 (5%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 623 cd/m² (5.95V) at 0.9 mA with CIE x=0.143, y=0.098.

Embodiment 4

[0057] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of 1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-77 (5%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 595 cd/m² (6.11V) at 0.9 mA with CIE x=0.140, y=0.088.

Embodiment 5

[0058] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of

1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-134(5%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 576 cd/m² (5.93V) at 0.9 mA with CIE x=0.139, y=0.084.

Comparative Example 1

[0059] A sheet of ITO glass is patterned to have a 3 mm×3 mm sized light emission area and washed to form a substrate. After the substrate is mounted in a vacuum chamber and the vacuum chamber is evacuated to have a basic pressure of 1×10^{-6} torr, organic substances are coated on the ITO in an order of CuPC (200 Å), NPB (400 Å), host DPVBi (200 Å)+dopant BD-a (1%), Alq₃ (350 Å), LiF (5 Å), and Al (1000 Å), to fabricate the organic electroluminescence device. The organic electroluminescence device fabricated thus shows 526 cd/m² (6.7V) at 0.9 mA with CIE x=0.136, y=0.188.

[0060] Results of the embodiments 1 to 5 and the comparative example 5 are shown in table 1, below.

TABLE 1

DEVICE	VOLTAGE (V)	CURRENT (mA)	BRIGHT-		
			NESS (cd/m ²)	CIE (x)	CIE (Y)
EMBODIMENT 1	5.82	0.9	616	0.143	0.101
EMBODIMENT 2	6.03	0.9	682	0.146	0.110
EMBODIMENT 3	5.95	0.9	623	0.143	0.098
EMBODIMENT 4	6.11	0.9	595	0.140	0.088
EMBODIMENT 5	5.93	0.9	576	0.139	0.084
COMPARATIVE EXAMPLE 1	6.7	0.9	526	0.136	0.188

[0061] It can be known that, as shown in above embodiments, by introducing a compound selected from BD-1 to BD-360 as the dopant substance of the electroluminescence layer of the present invention, the organic electroluminescence device can be driven at a voltage 0.59V~0.88V lower than the related art dopant substance, with low CIE coordinates improving color purity. Along with this, the organic electroluminescence device of the blue fluorescence compound of the present invention has high light emission efficiency and a long light emission life.

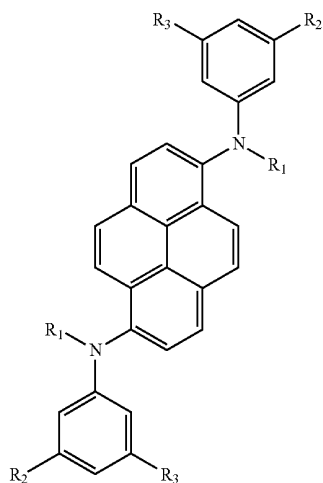
[0062] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of

the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A blue fluorescence compound consisting of the following chemical formula 1.

[Chemical Formula 1]



where, R1, R2, and R3 may or may not be identical substances, and each of the R1, R2, and R3 is one of substances selected from an aromatic group, a heterocyclic group, an aliphatic group and hydrogen, independently.

2. The blue fluorescence compound as claimed in claim 1, wherein each of the R1, R2, and R3 is one of substances selected from biphenyl, naphthyl, phenanthrene, terphenyl, pyridine), quinoline, deuterium, and a substituent thereof, independently.

3. The blue fluorescence compound as claimed in claim 1, wherein the aromatic group is an aromatic compound having alkyl, alkoxy, halogen, cyano, or silyl group.

4. The blue fluorescence compound as claimed in claim 1, wherein the alkyl group is one selected from methyl, ethyl, propyl, i-propyl, and t-butyl,

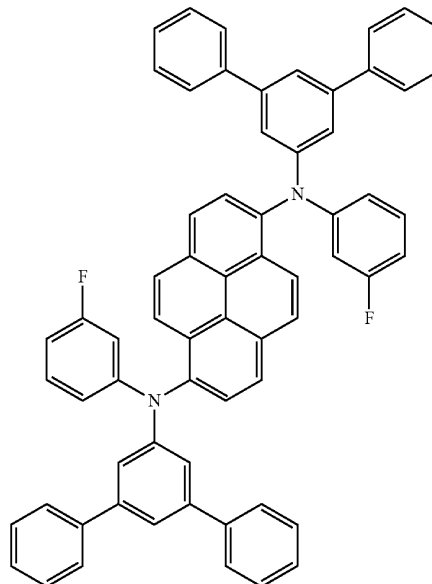
the alkoxy group is one selected from methoxy, ethoxy, and butoxy,

the halogen group is one selected from fluorine and chlorine, and

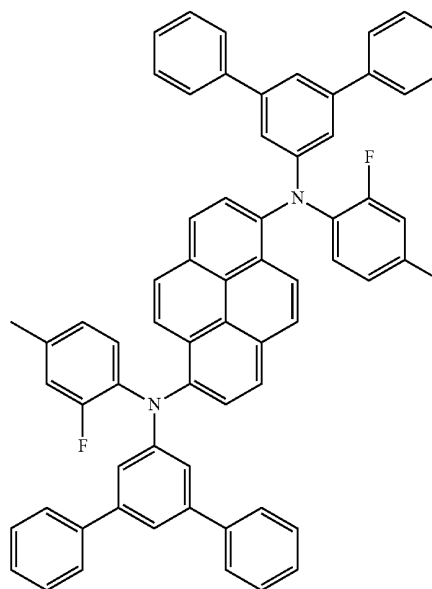
the silyl group is trimethylsilyl.

5. The blue fluorescence compound as claimed in claim 1, wherein the chemical formula 1 is a compound selected from compounds of the following BD-1~BD-360:

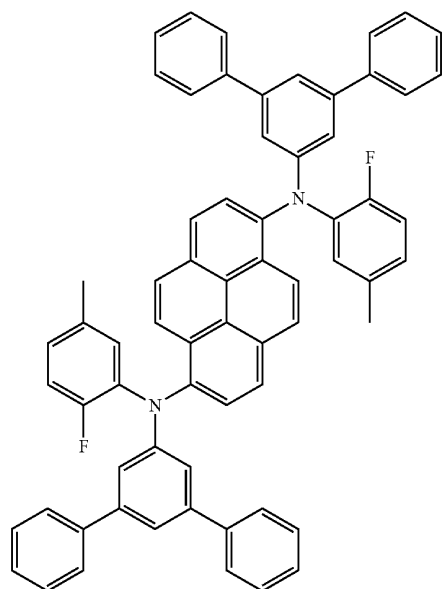
BD 1



BD 2

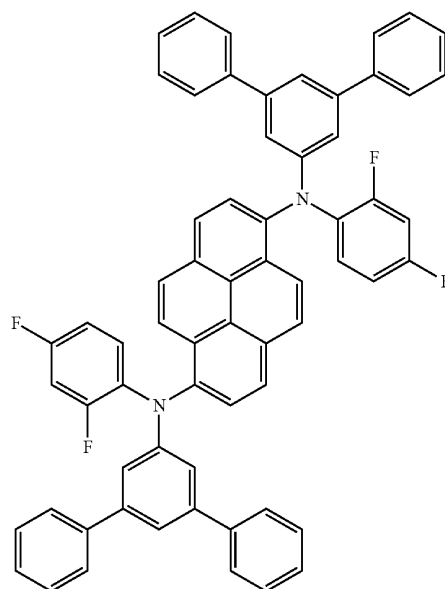


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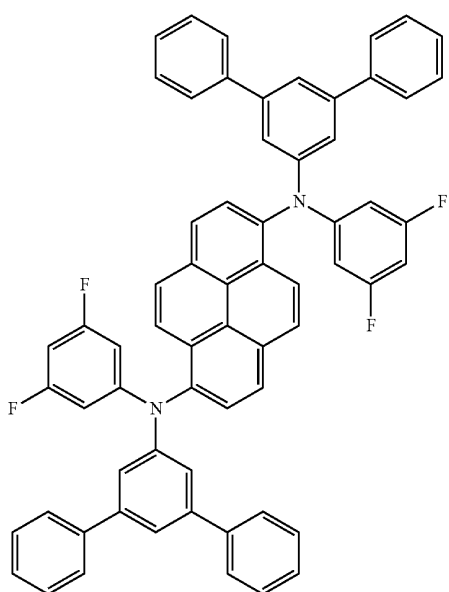
BD 3

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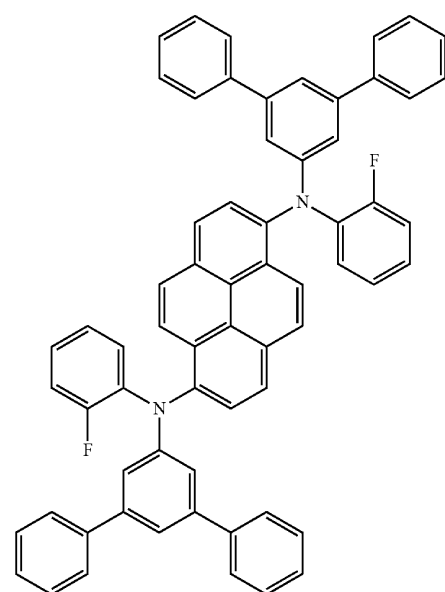


BD 5

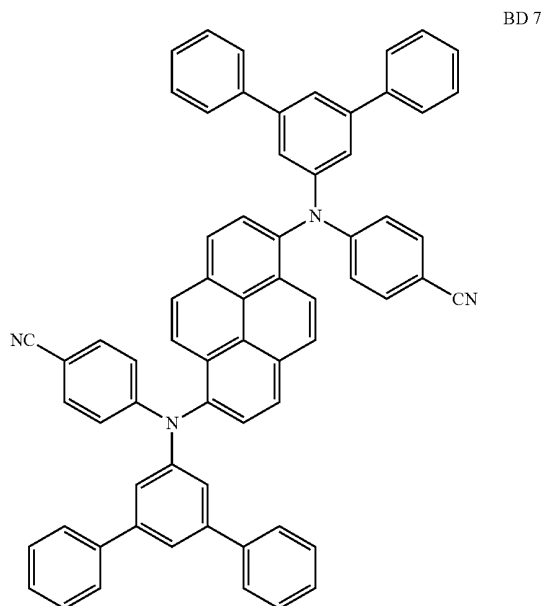
BD 4



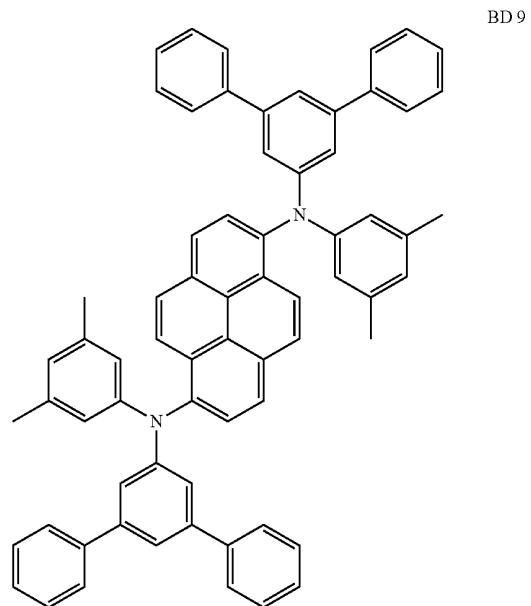
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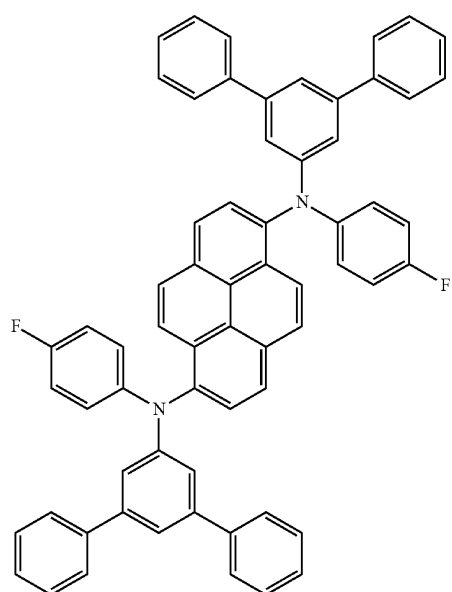
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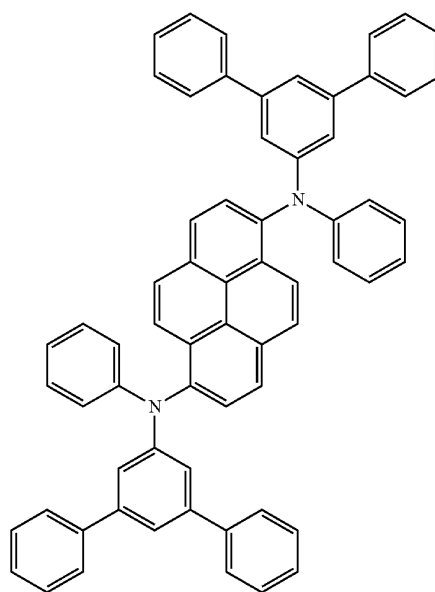
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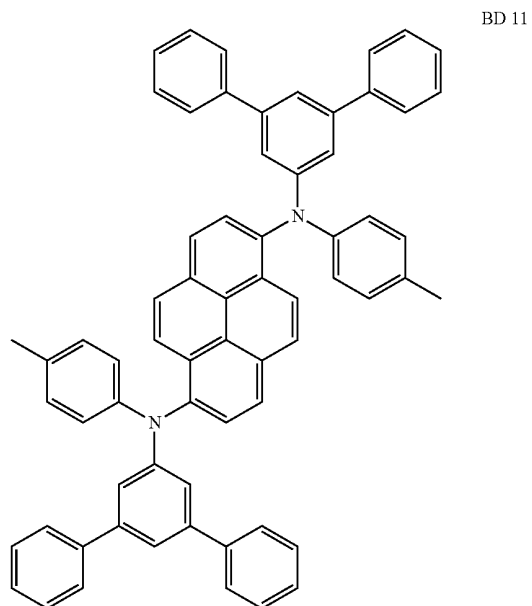
BD 8



BD 10

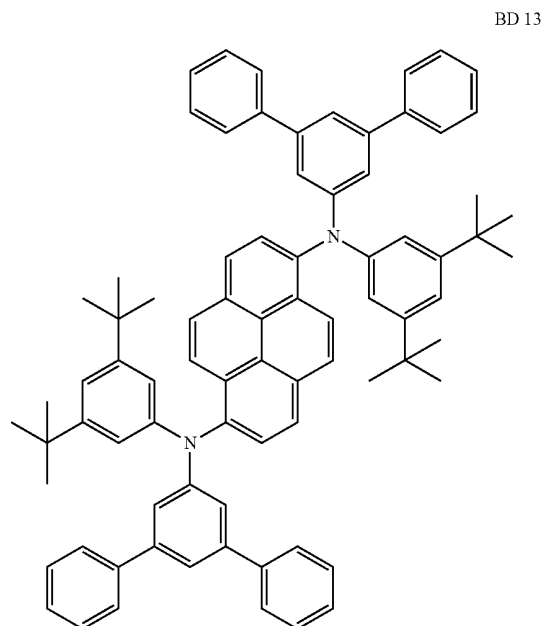


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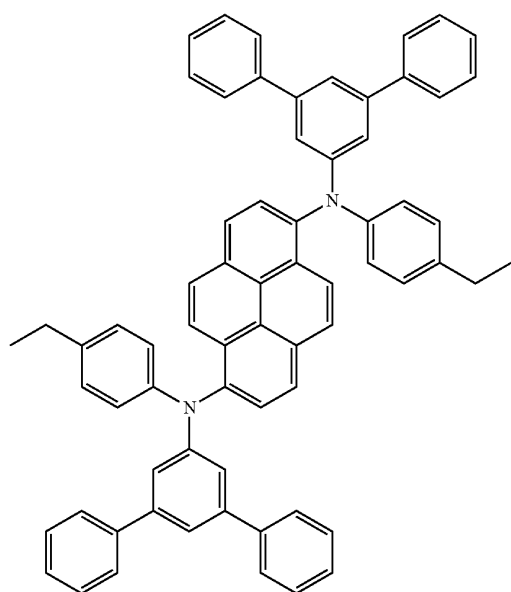
BD 11

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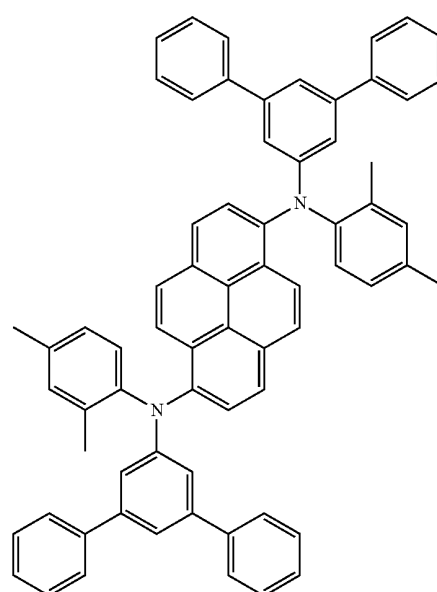
BD 13

BD 12



BD 12

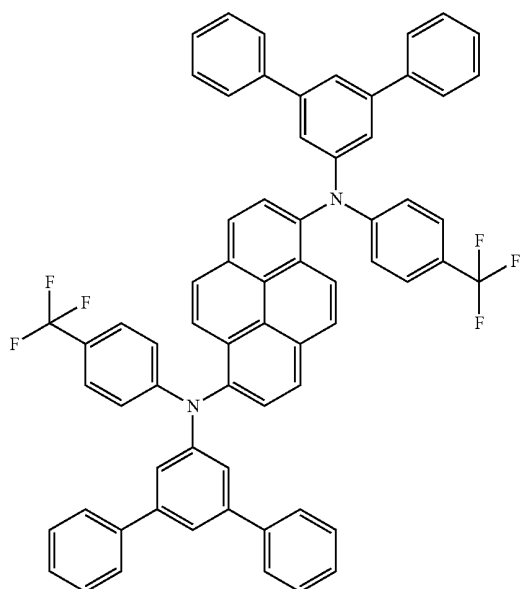
BD 14



BD 14

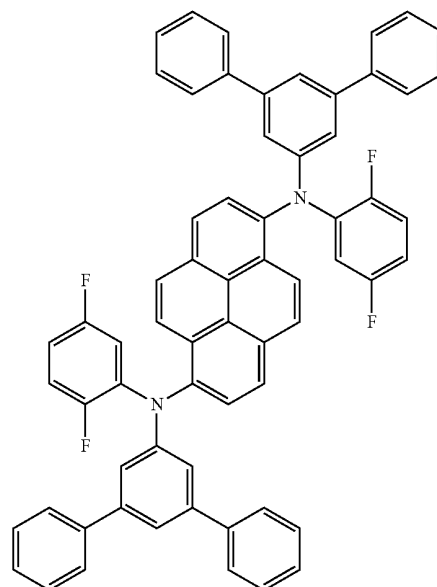
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BD 19

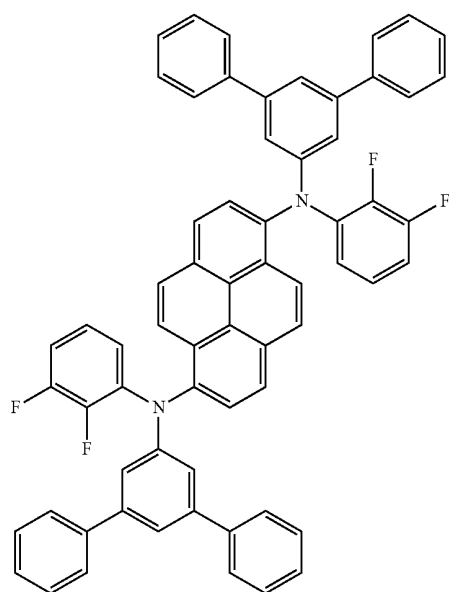


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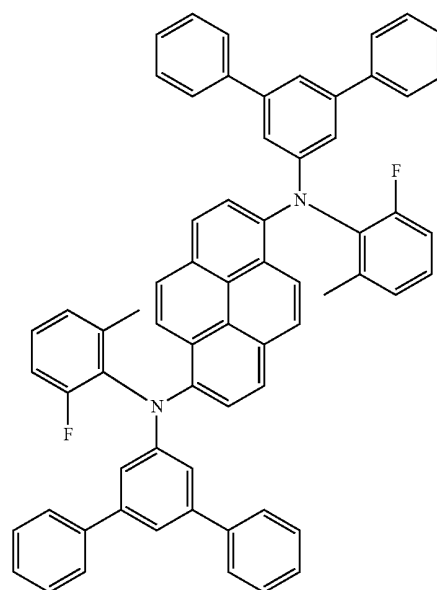
BD 21



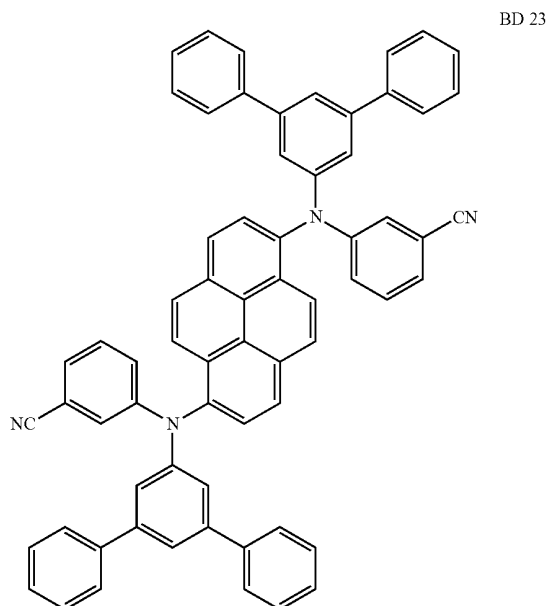
BD 20



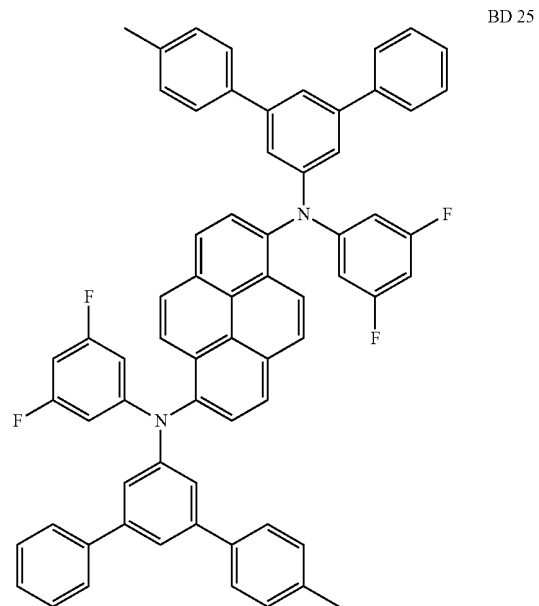
BD 22



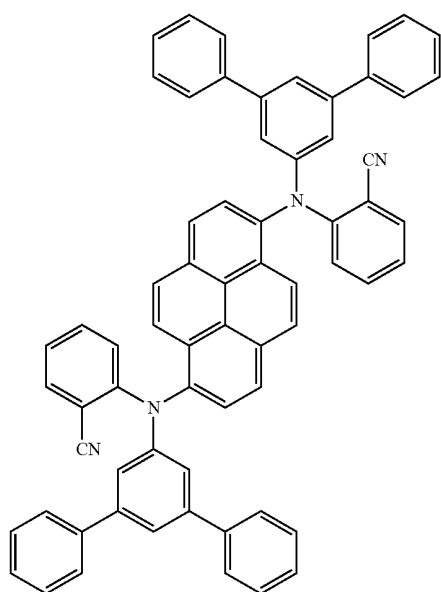
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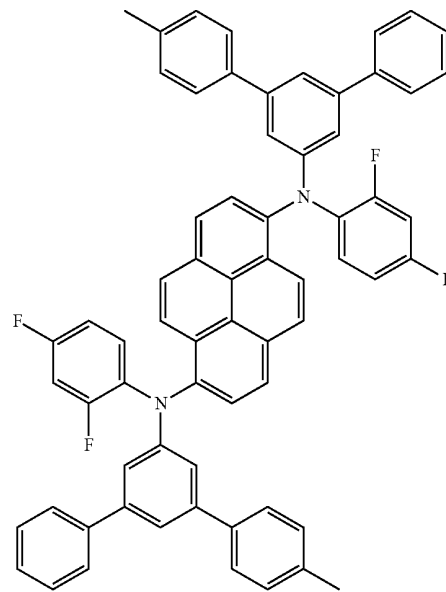
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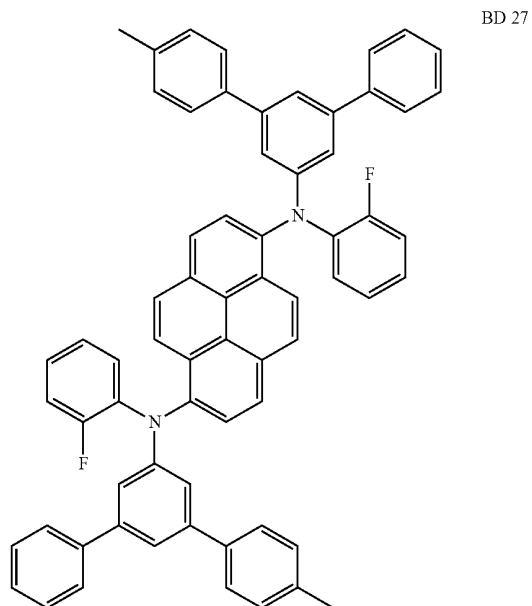
BD 24



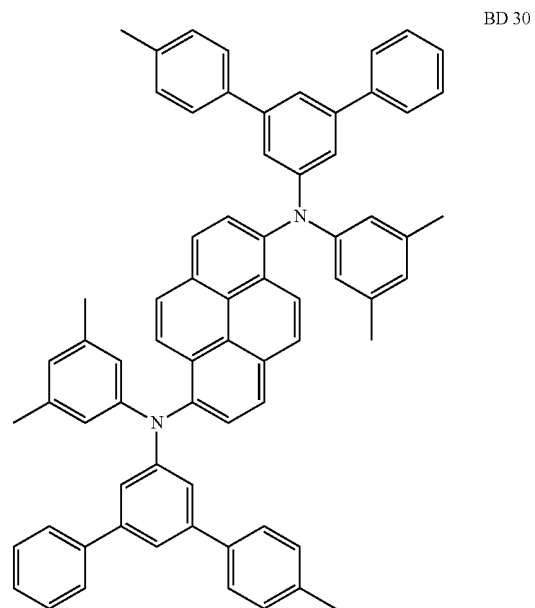
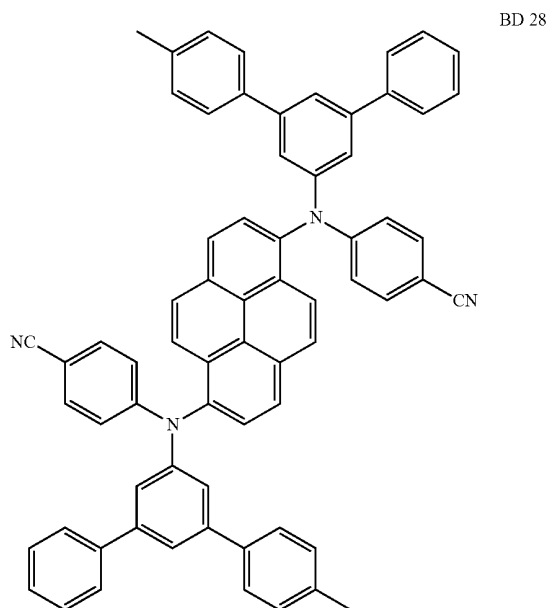
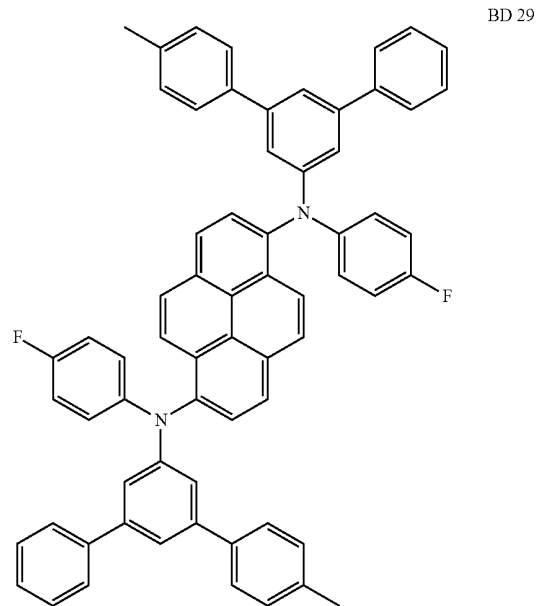
BD 26



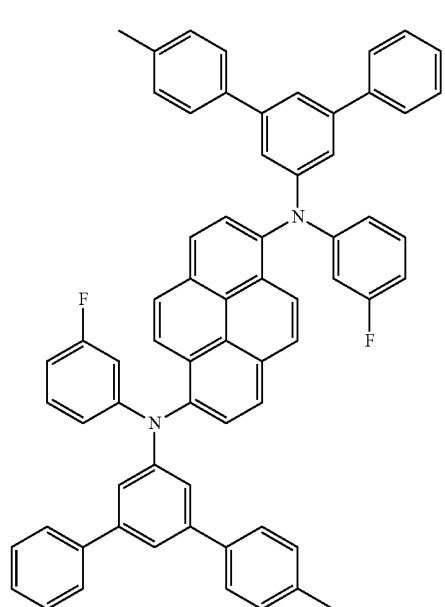
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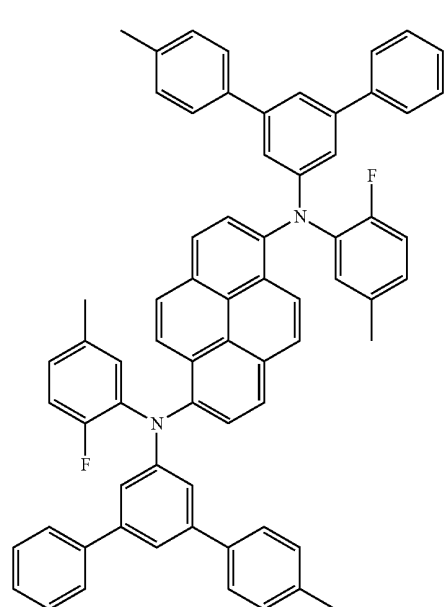
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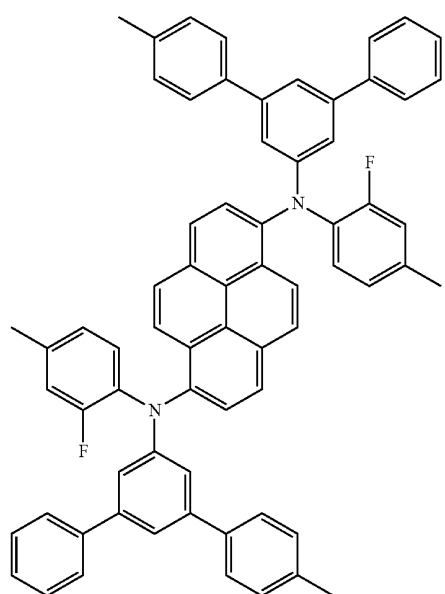
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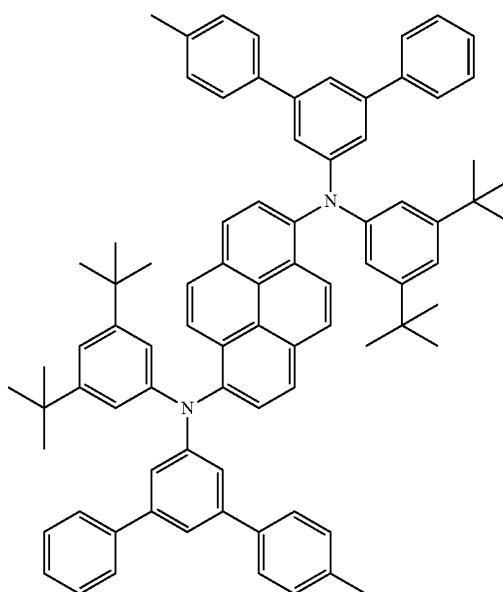
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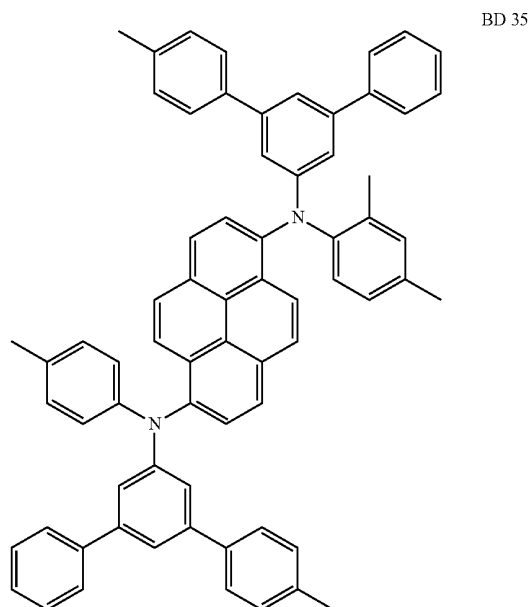
BD 32



BD 34

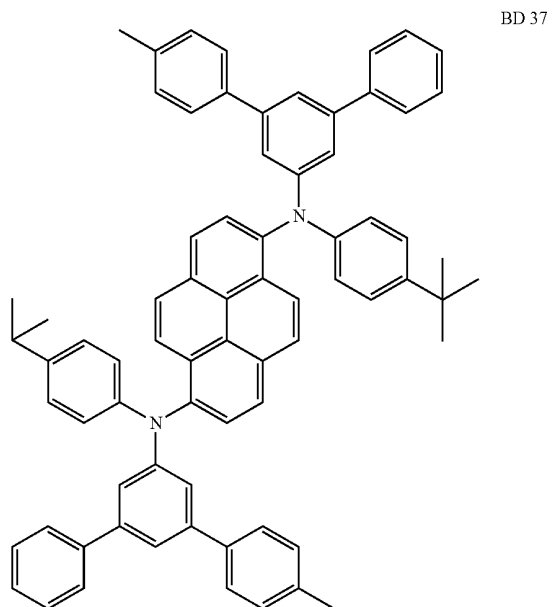


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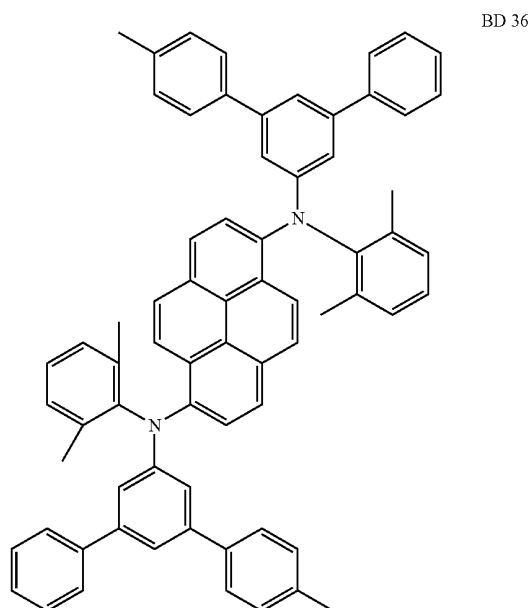


BD 35

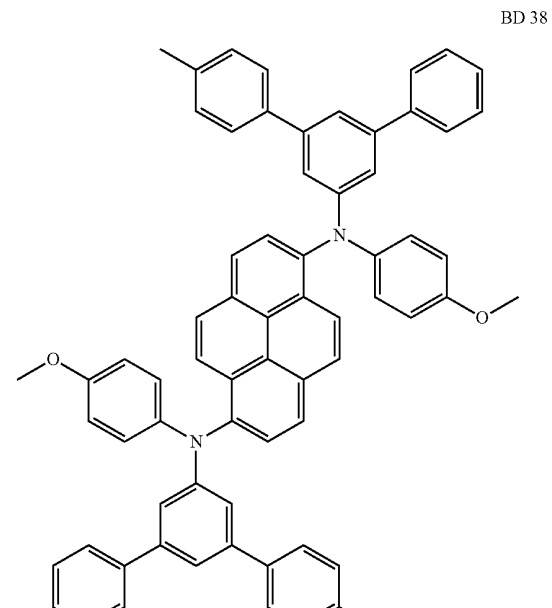
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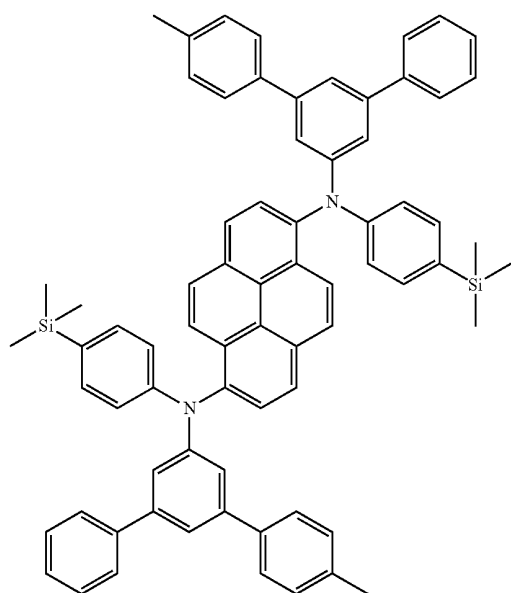
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BD 38

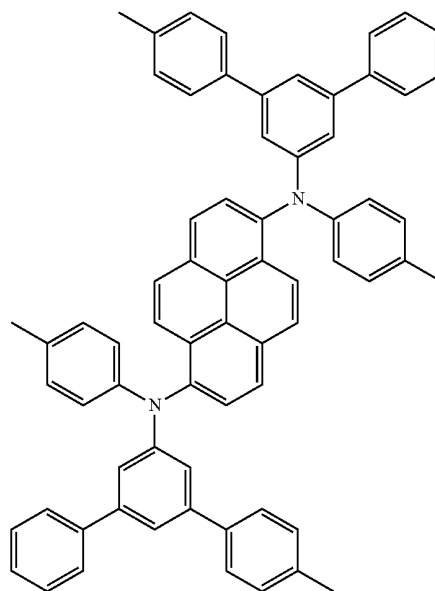
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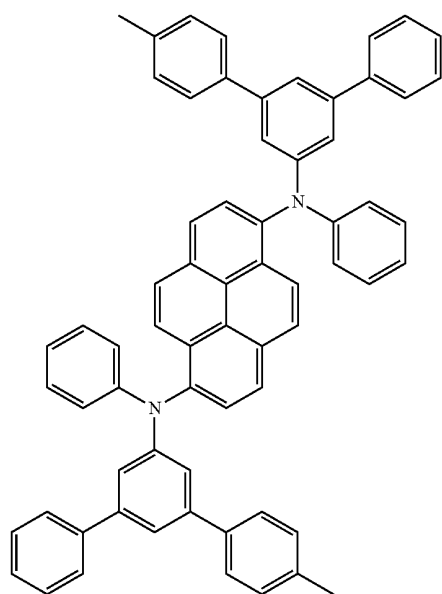


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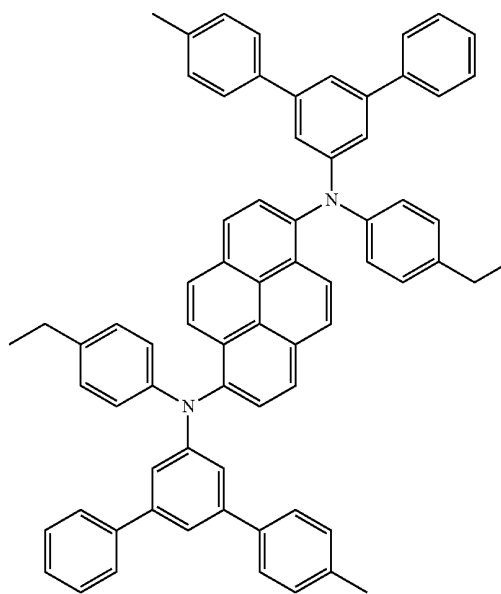
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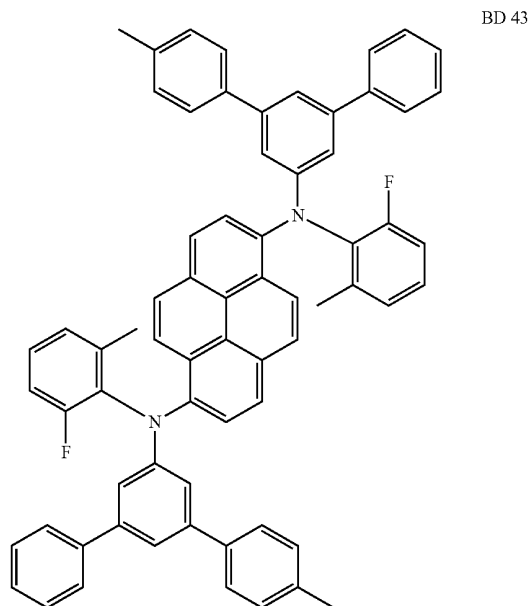
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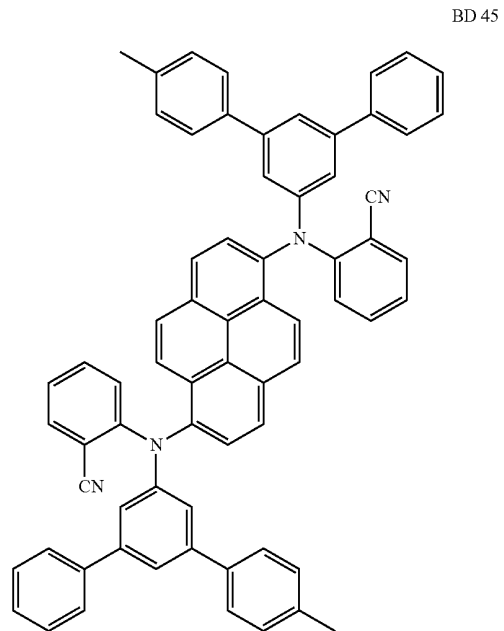
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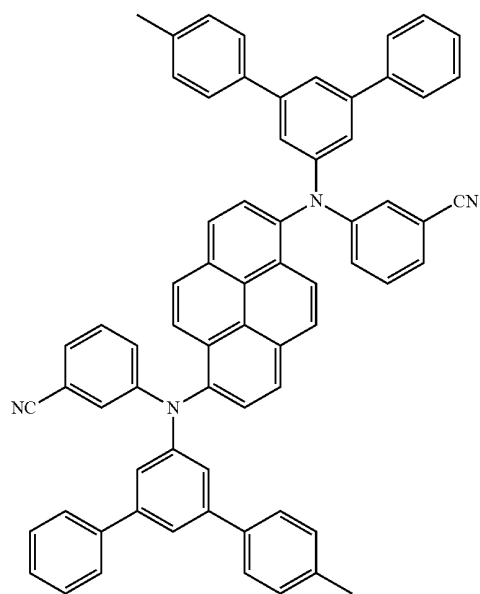
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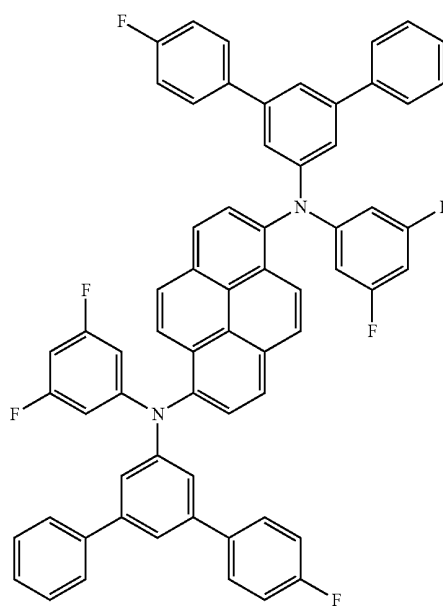
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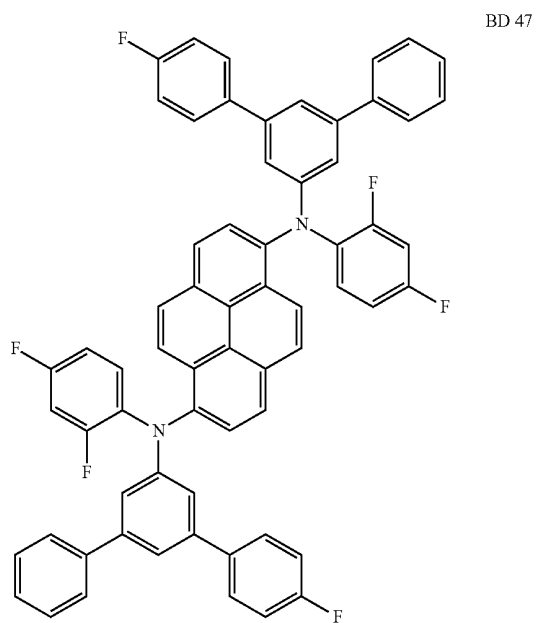
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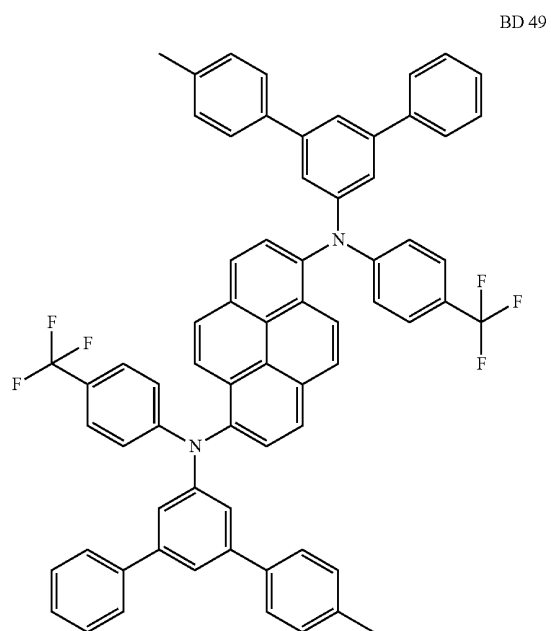
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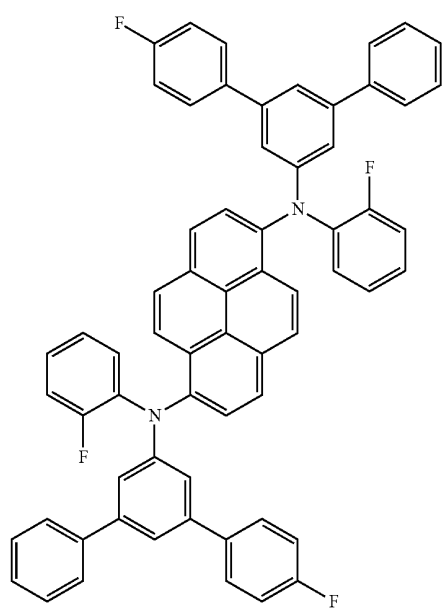
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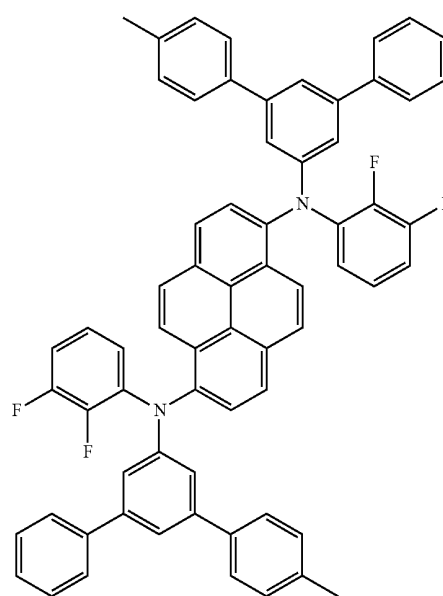
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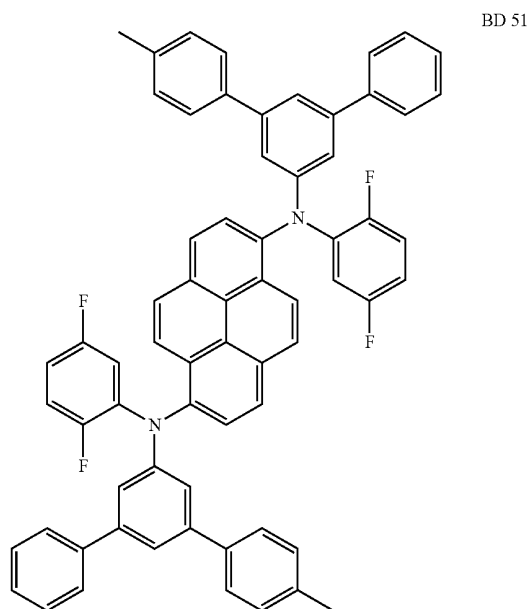
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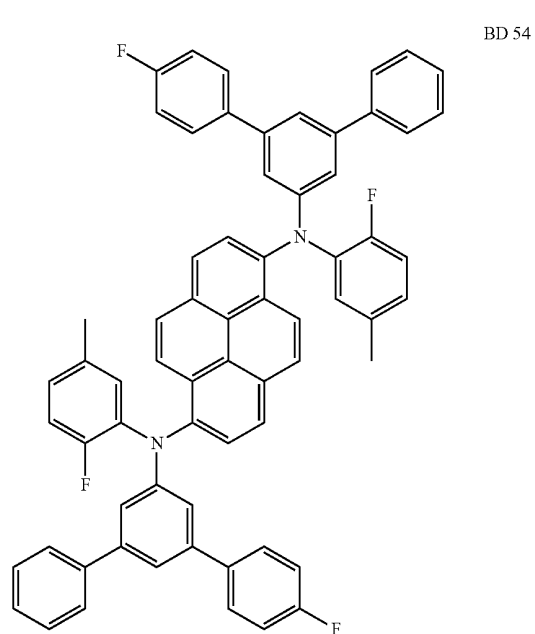
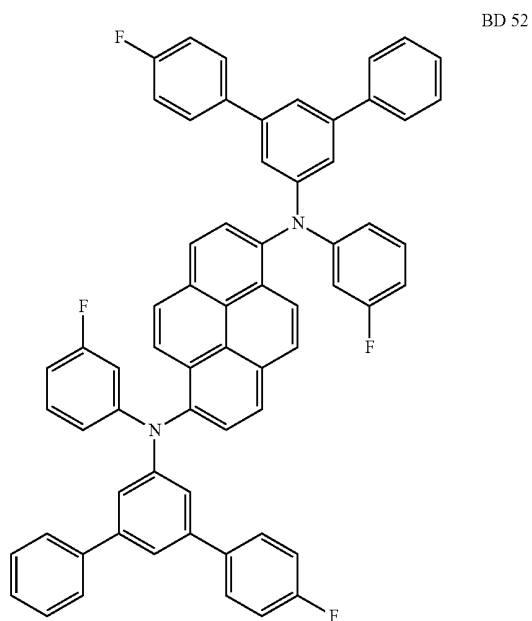
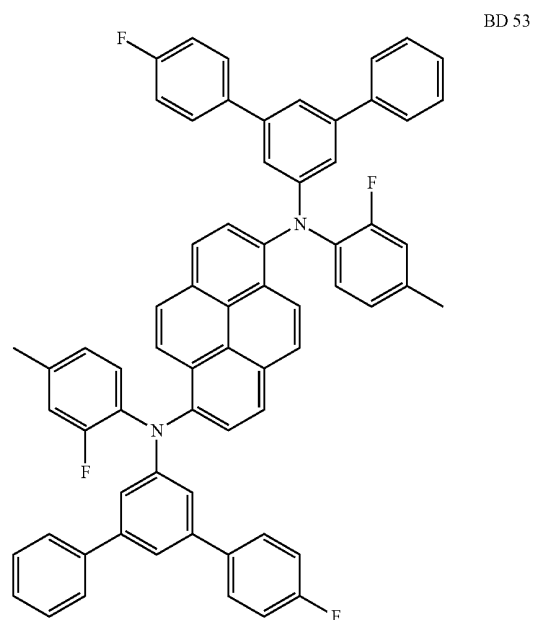
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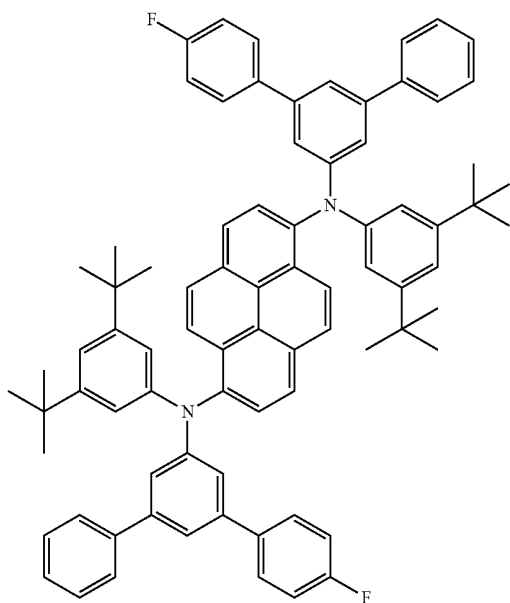


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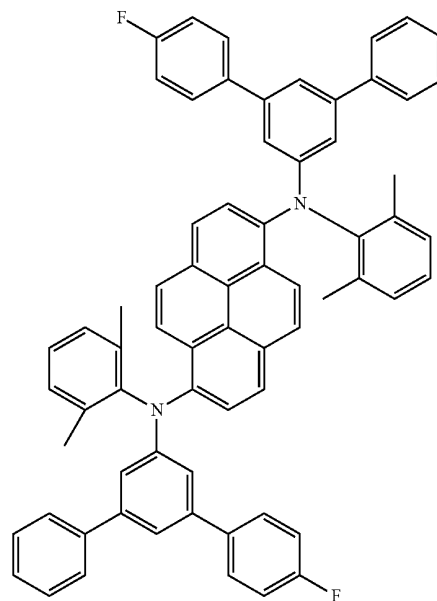
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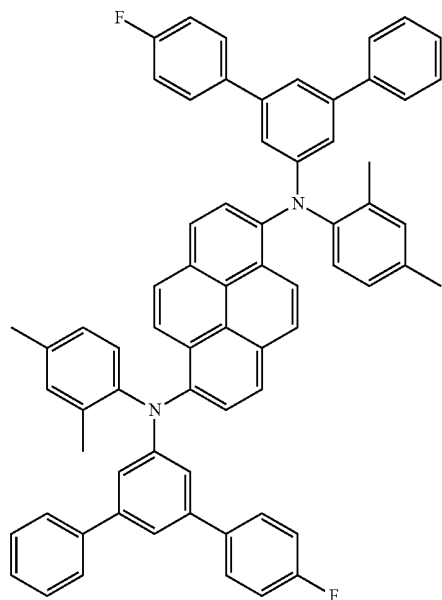


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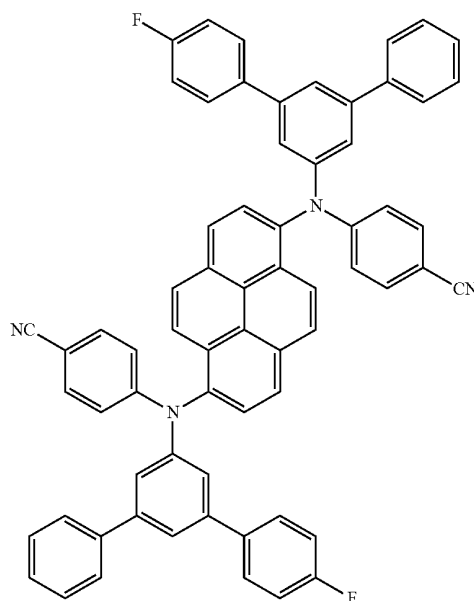
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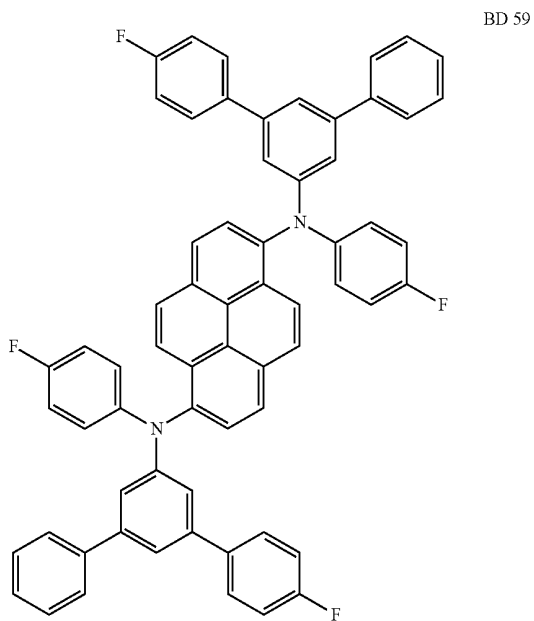
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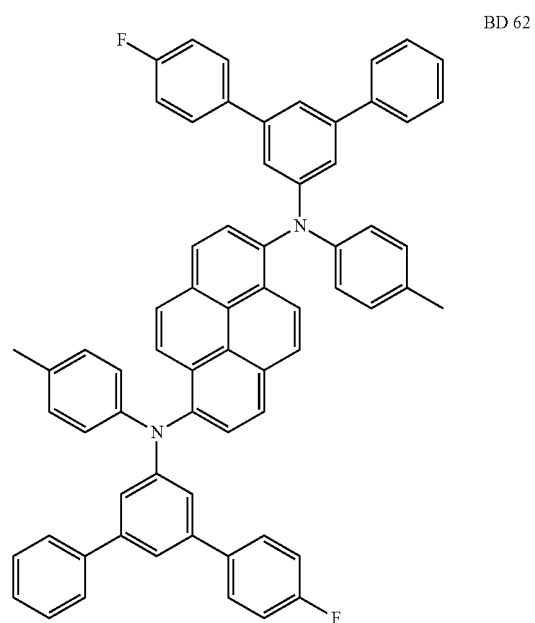
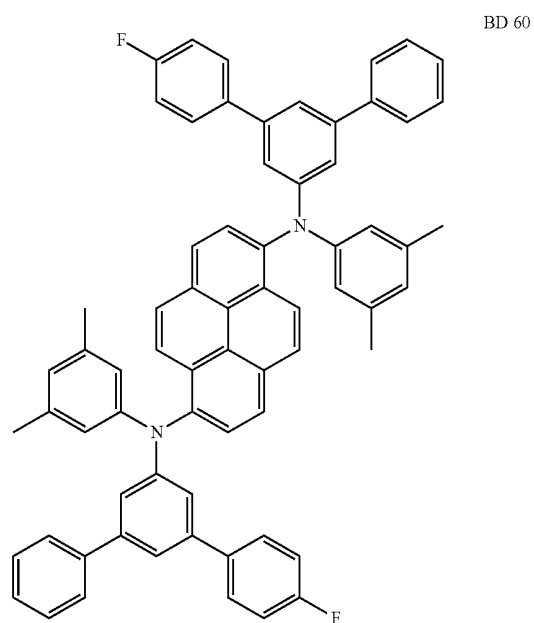
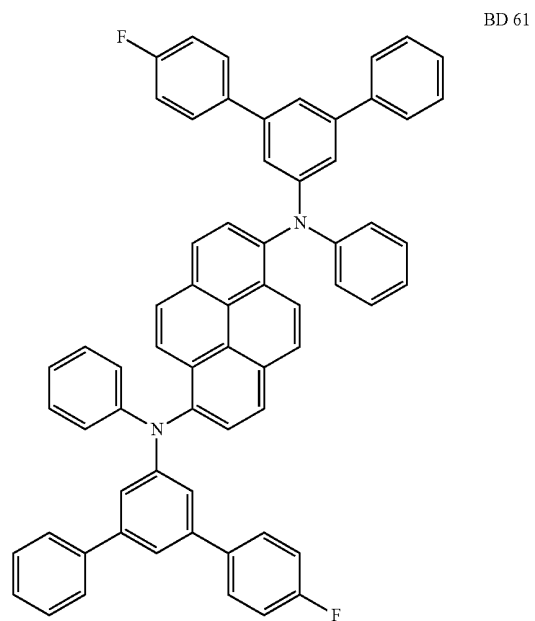
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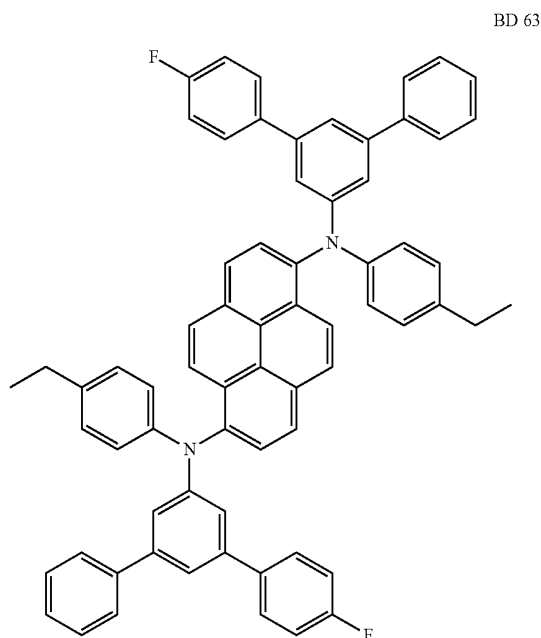
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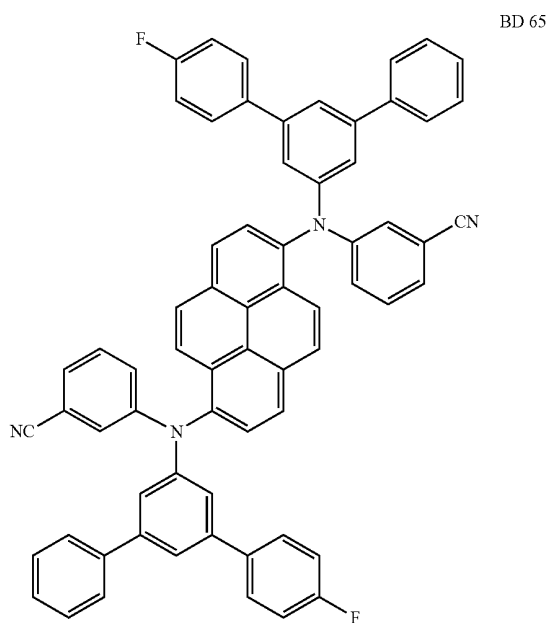
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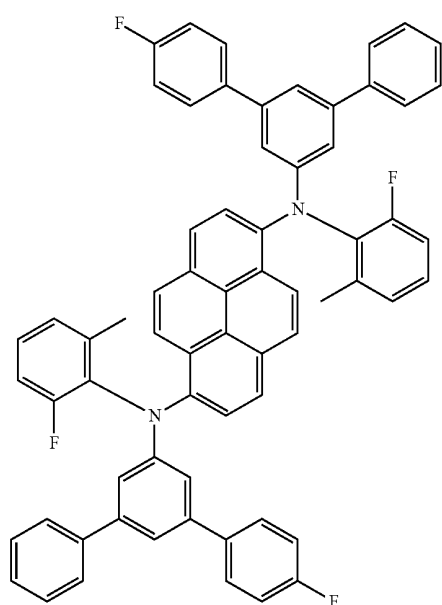
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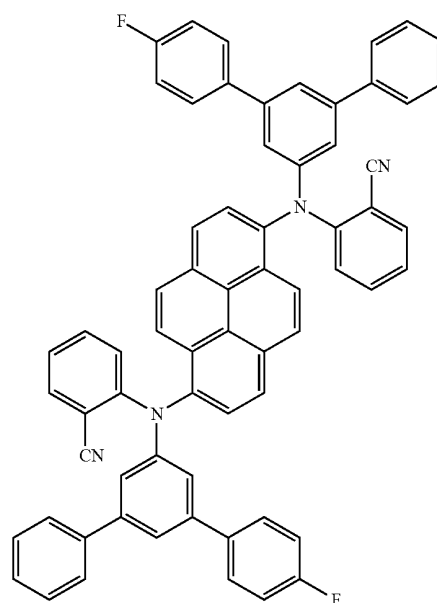
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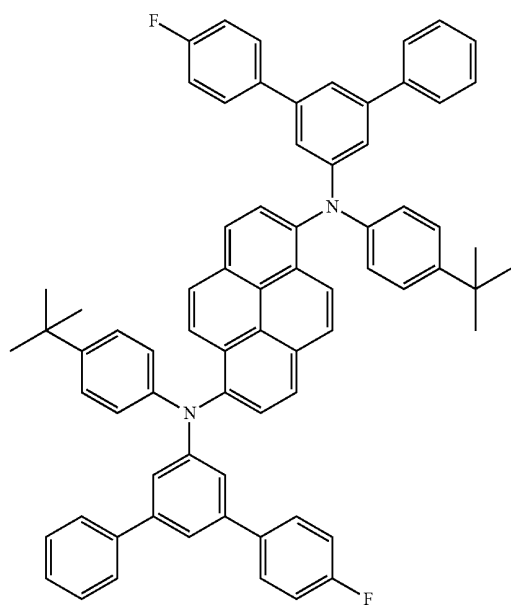


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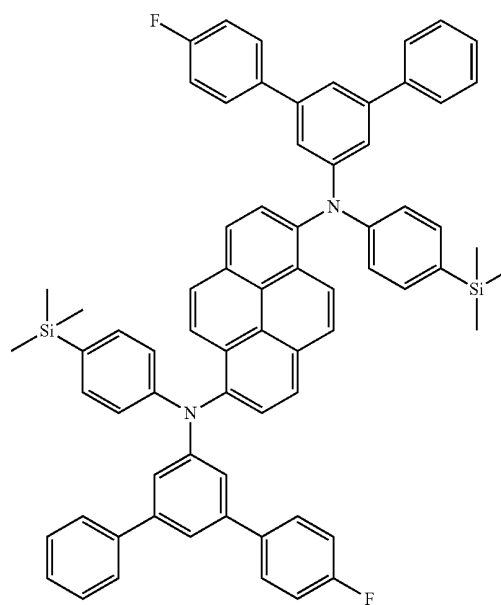
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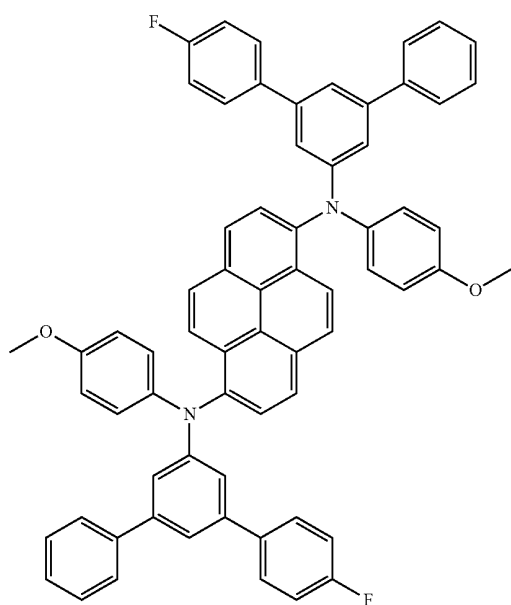


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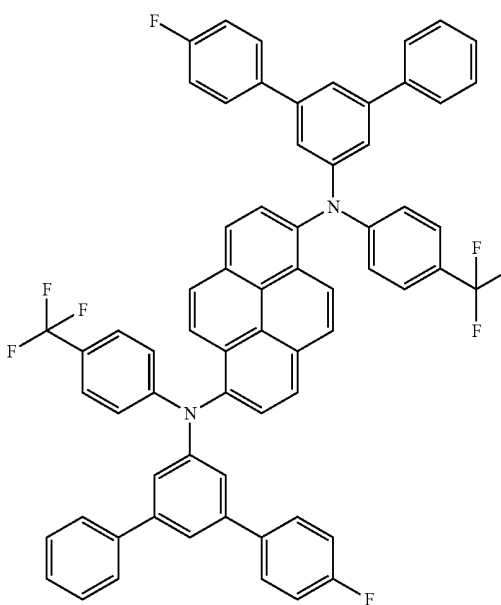
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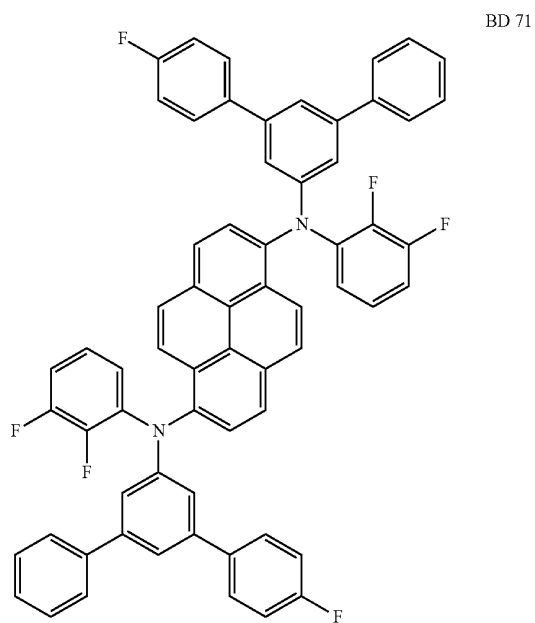
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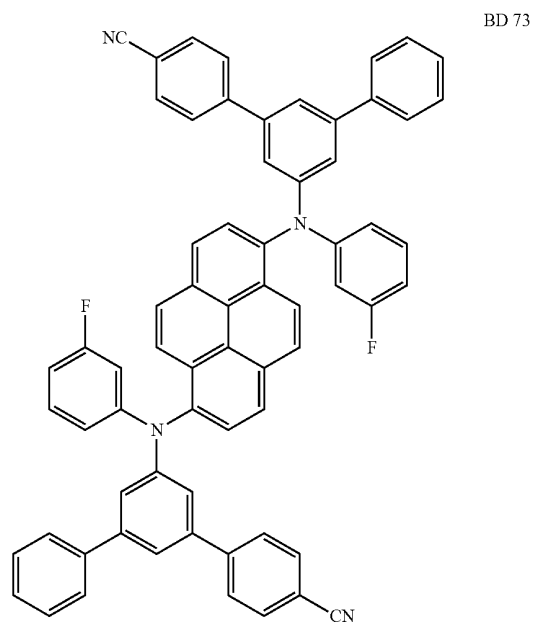
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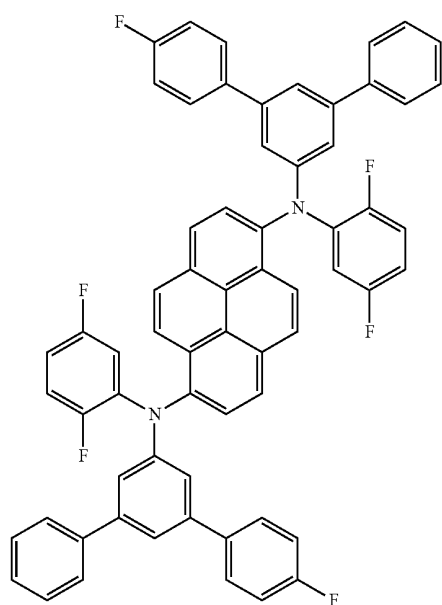
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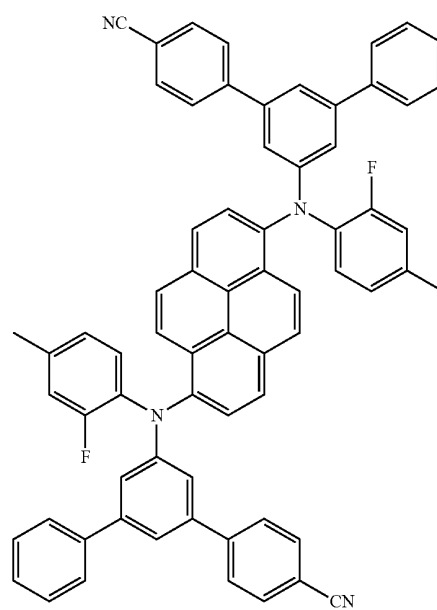
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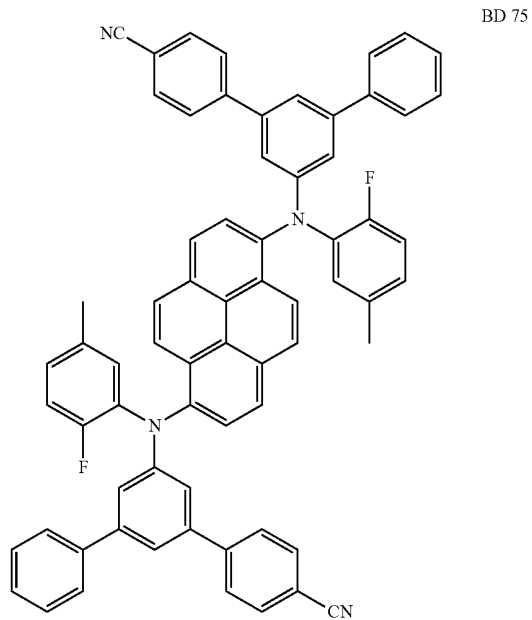
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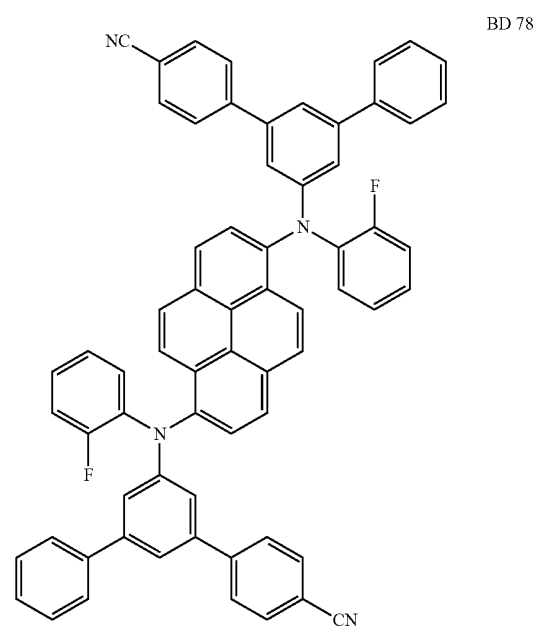
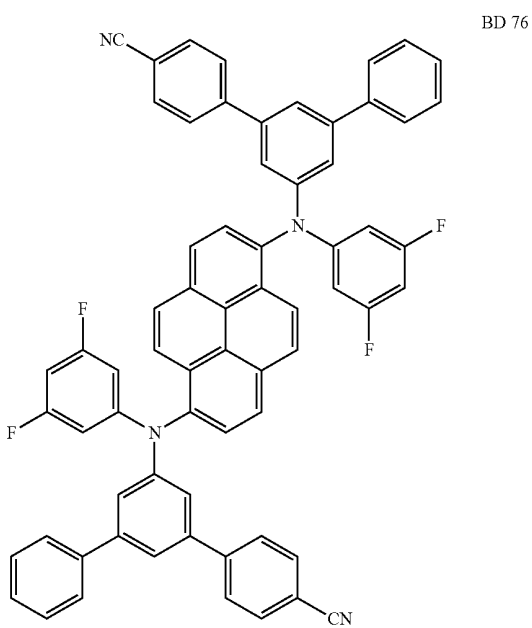
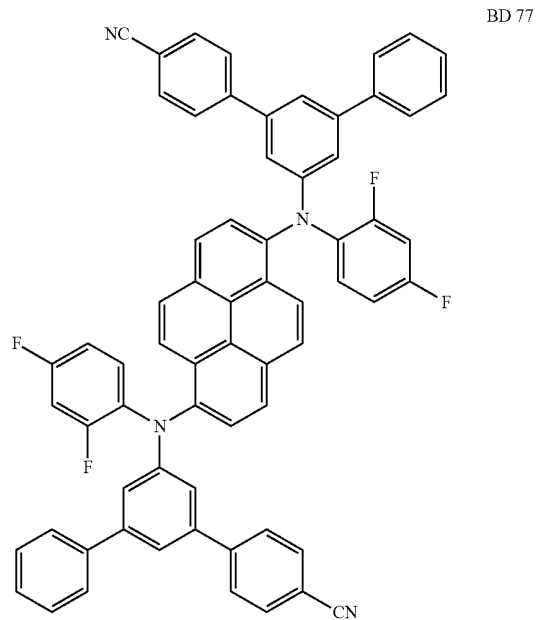
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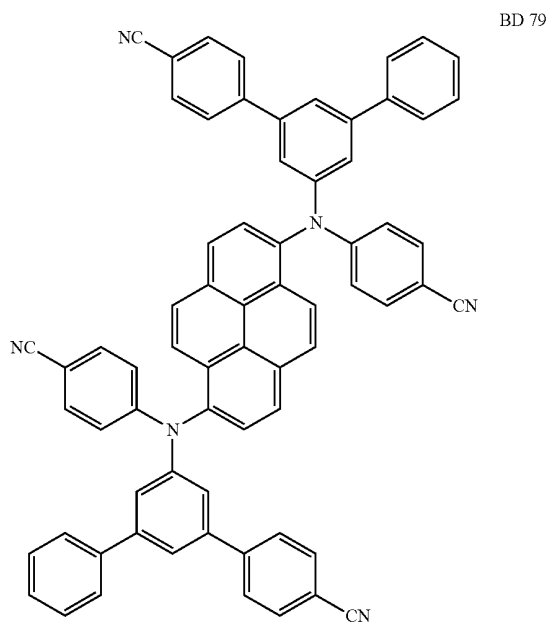
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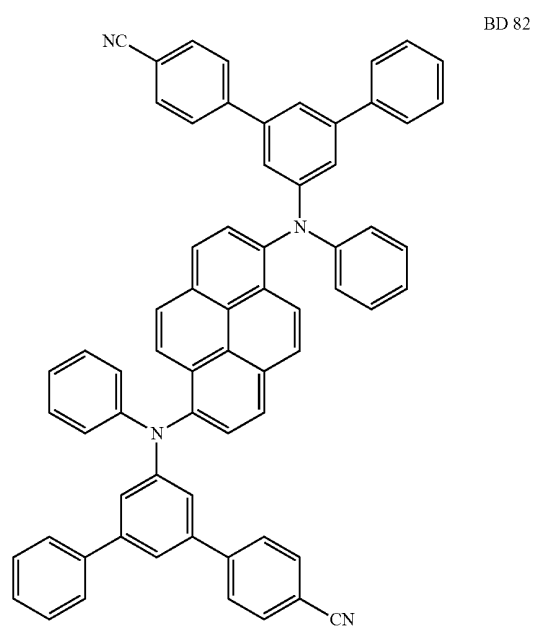
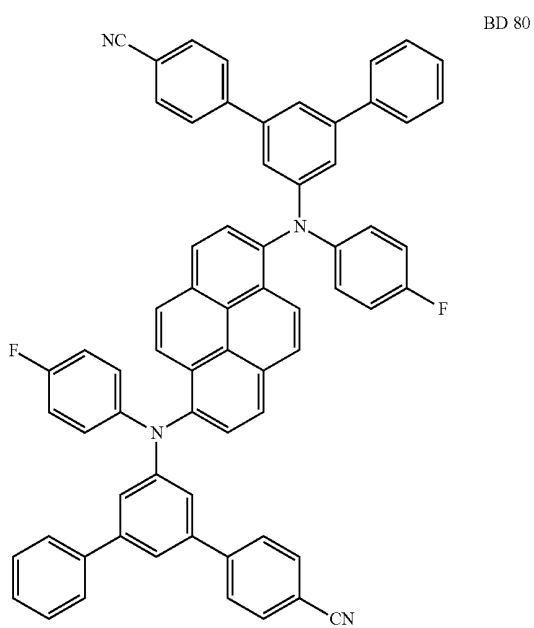
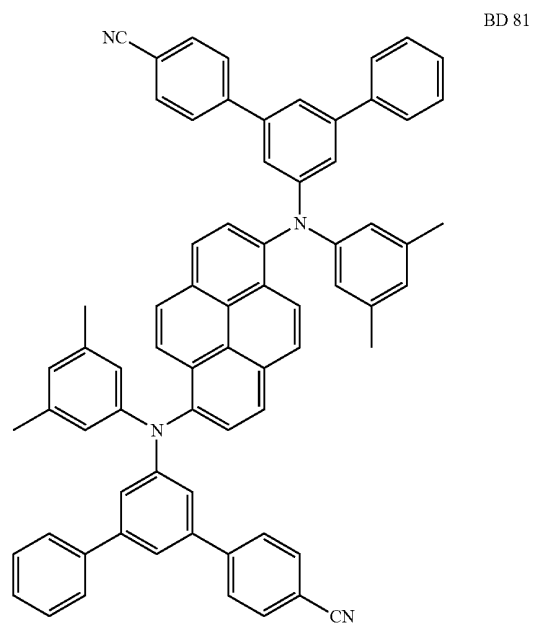
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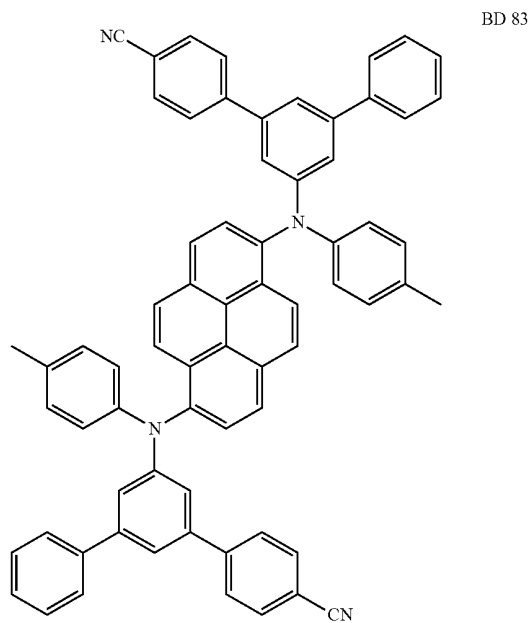
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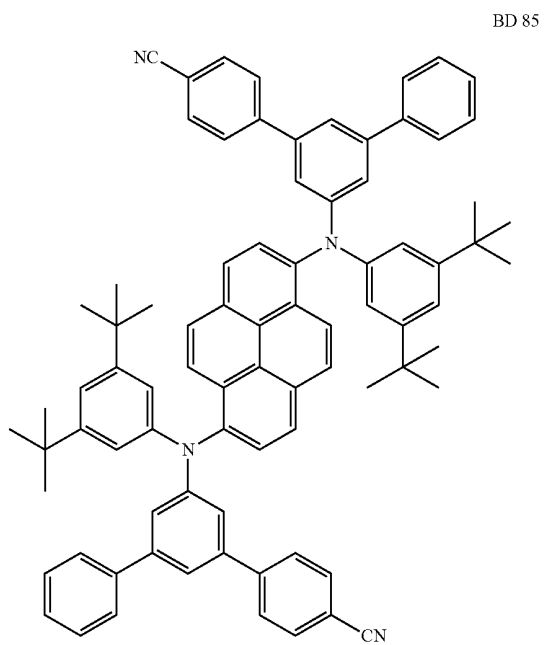
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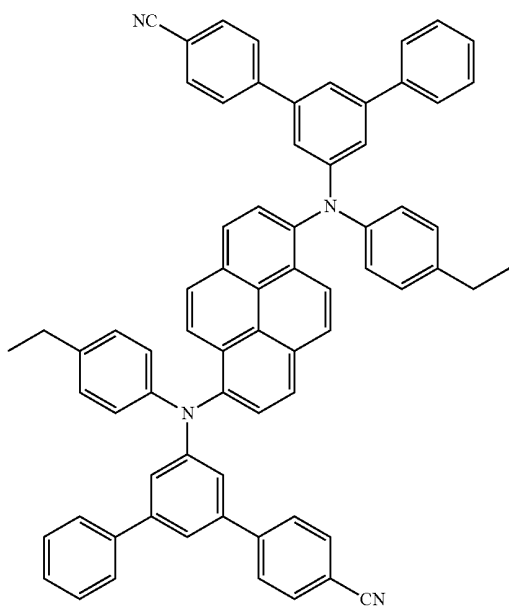
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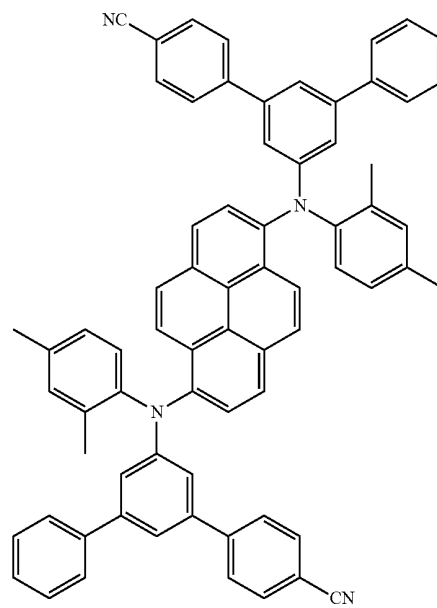
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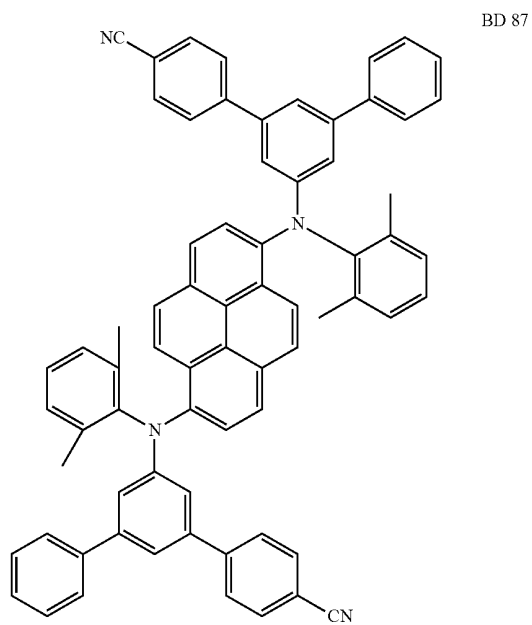
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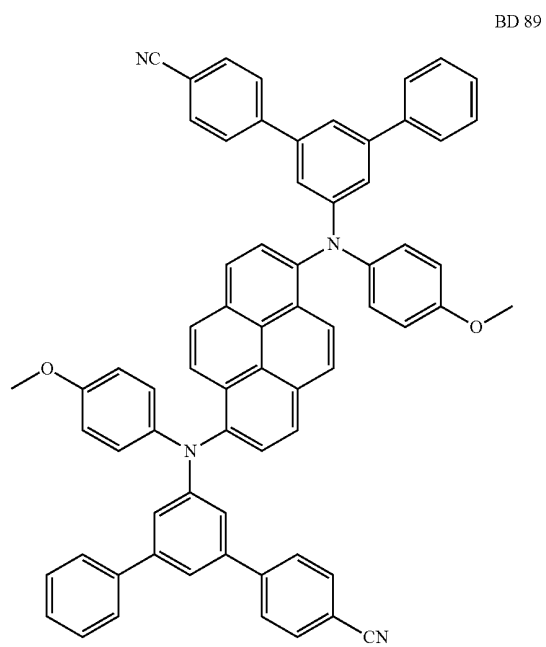
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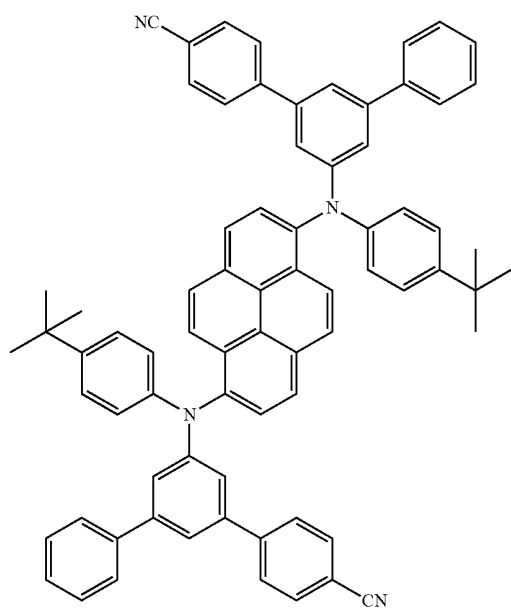
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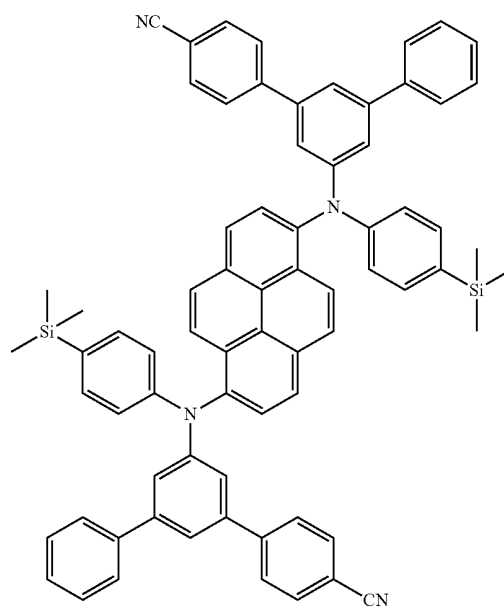
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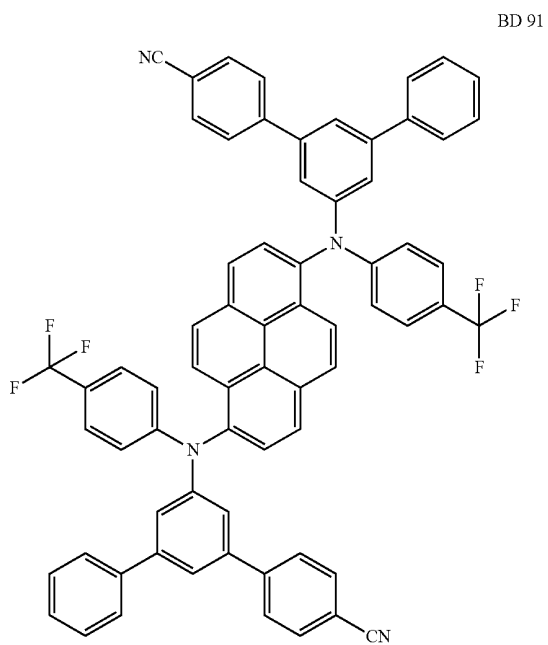
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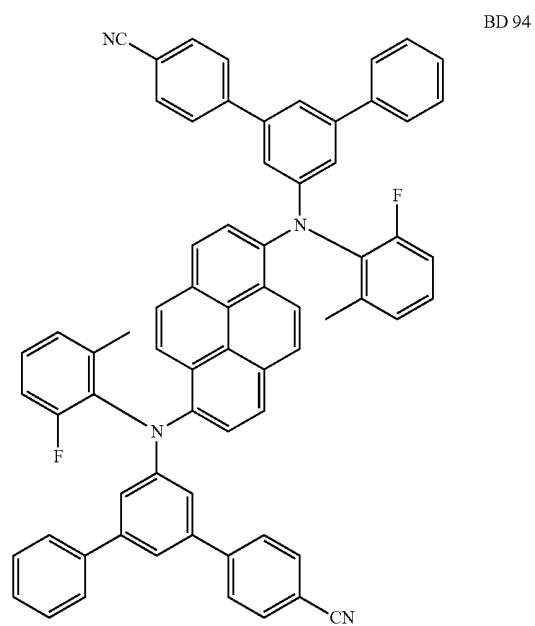
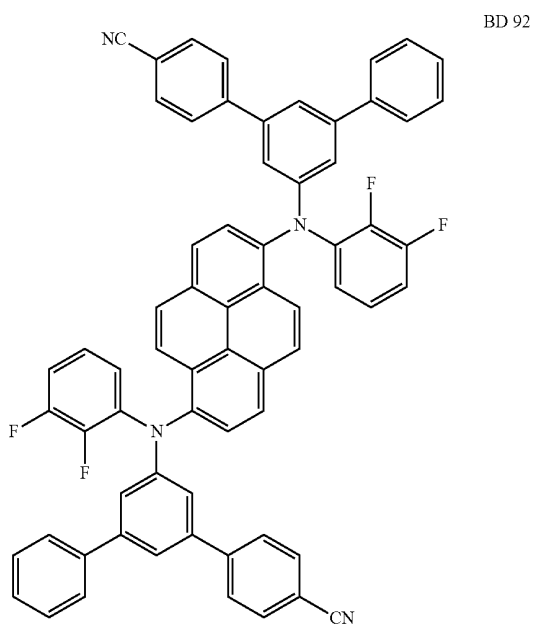
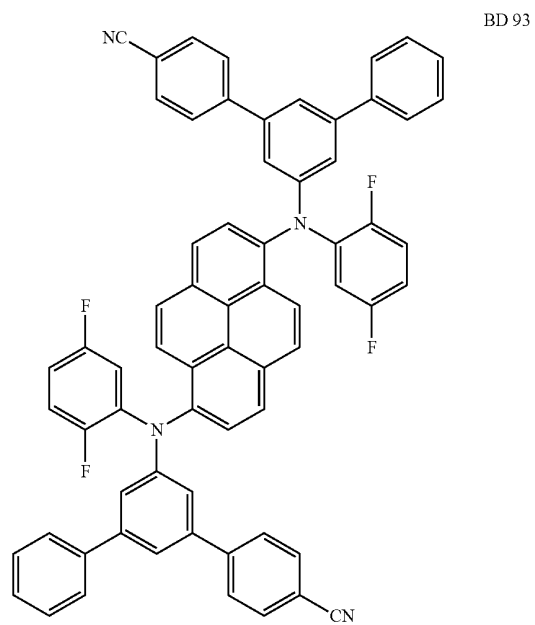
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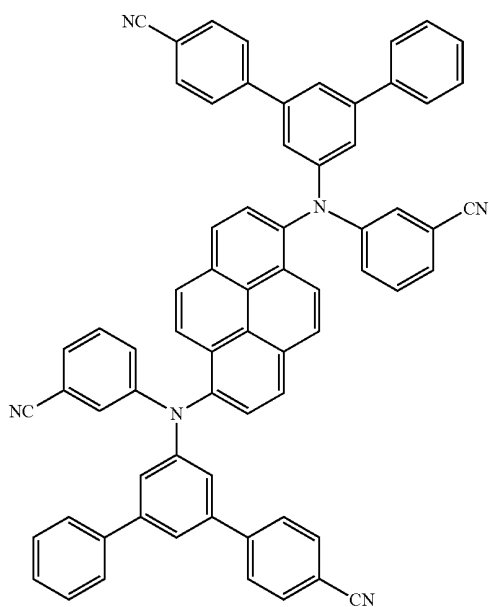


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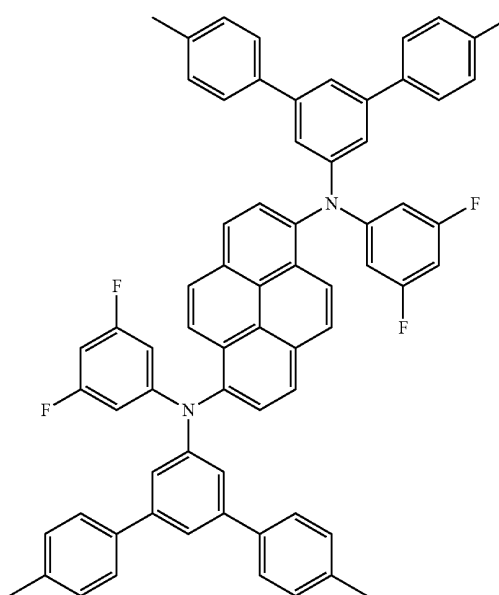
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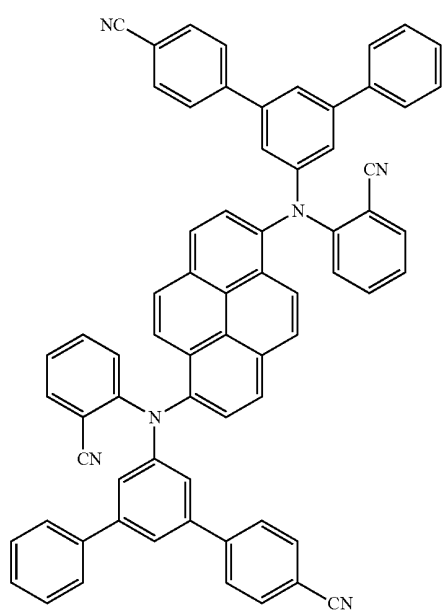


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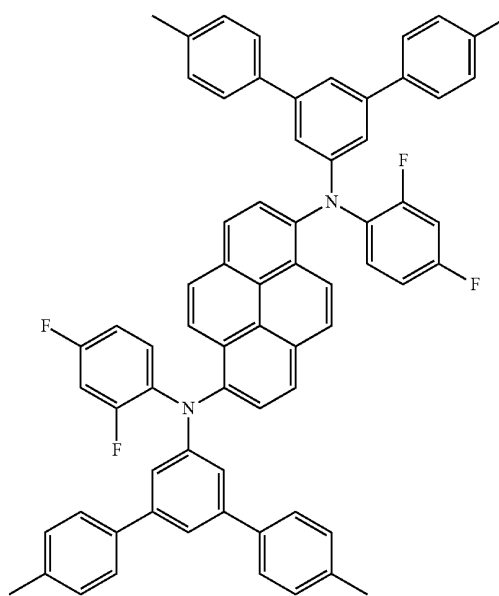
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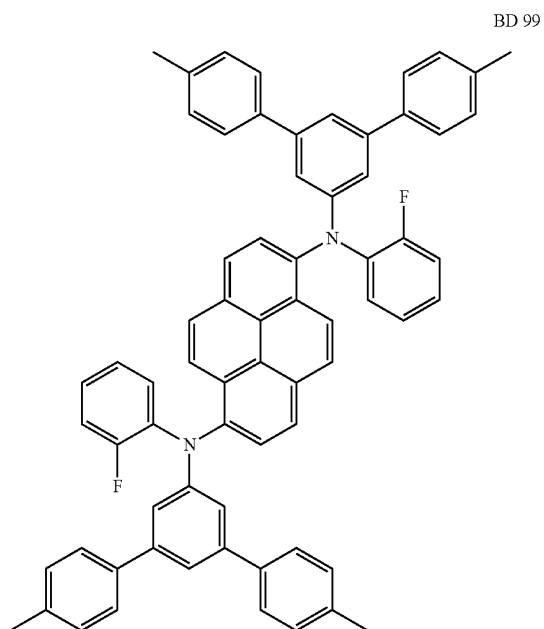
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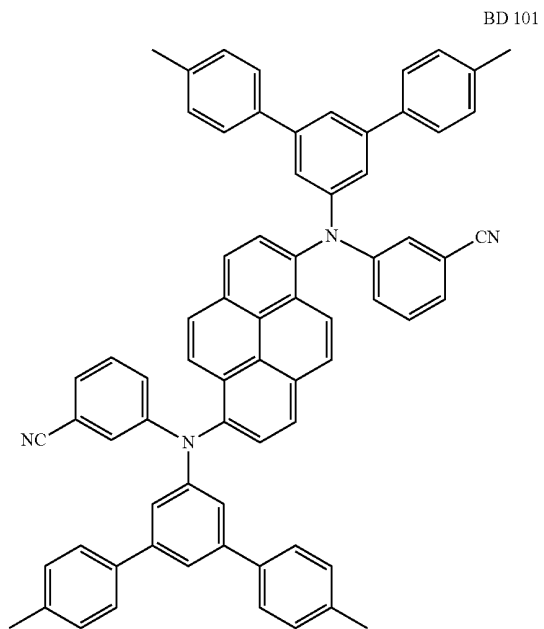
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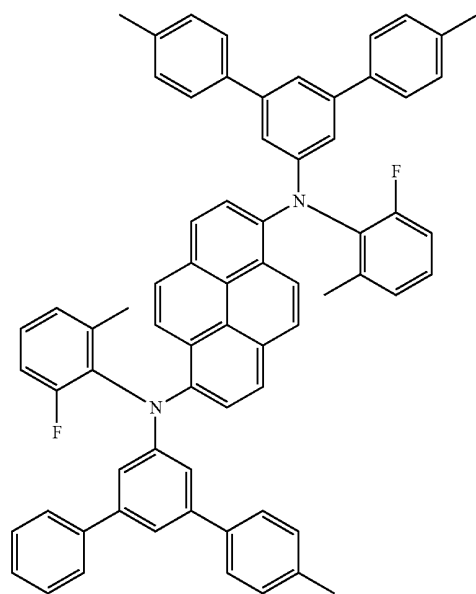
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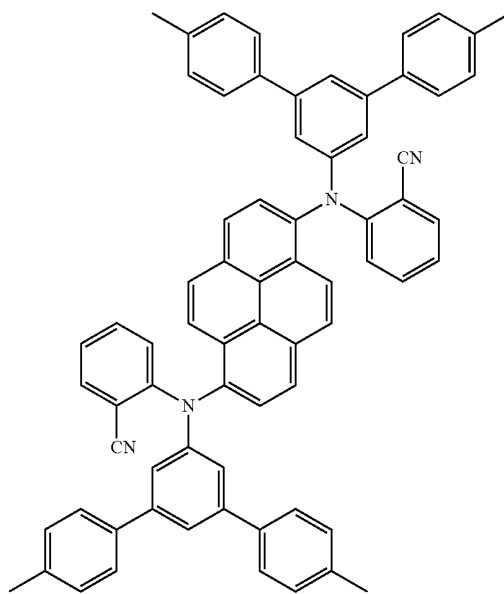
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BD 100

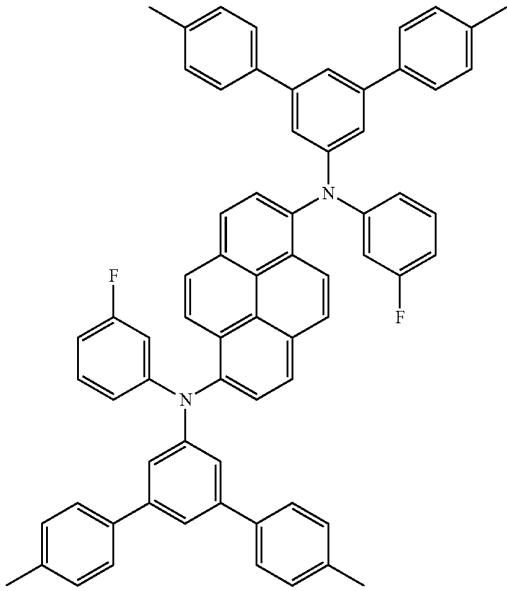


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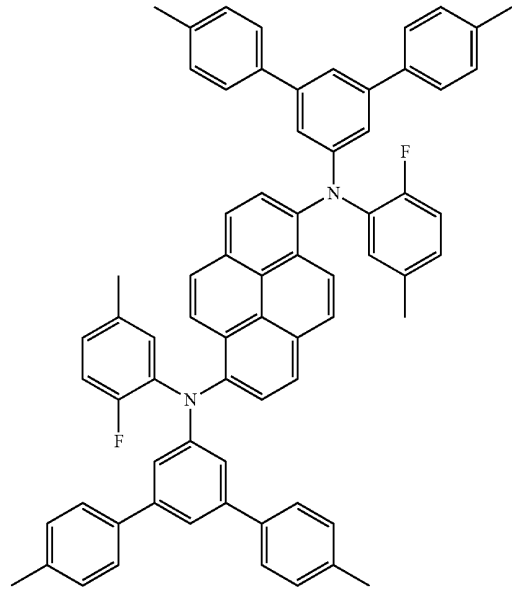
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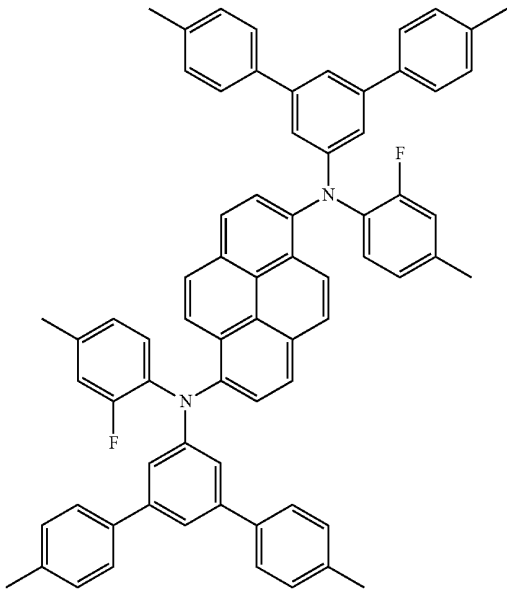


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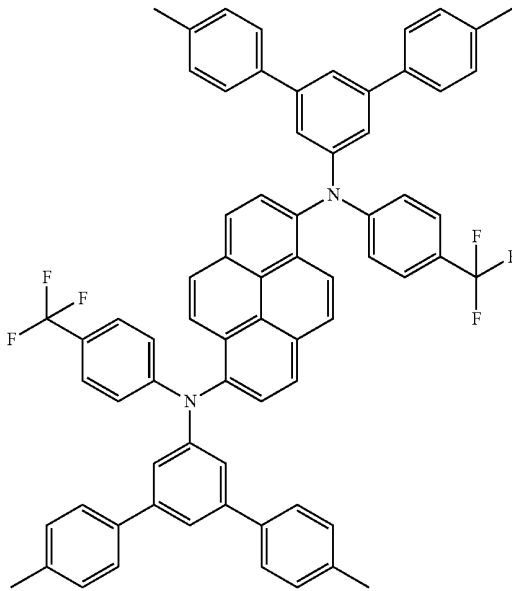
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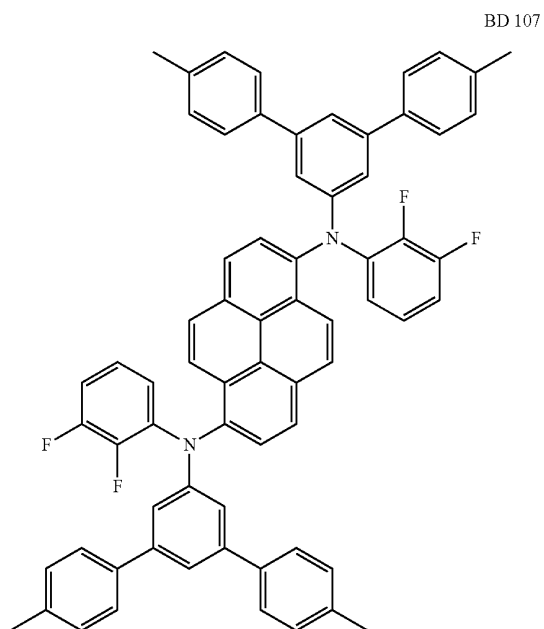
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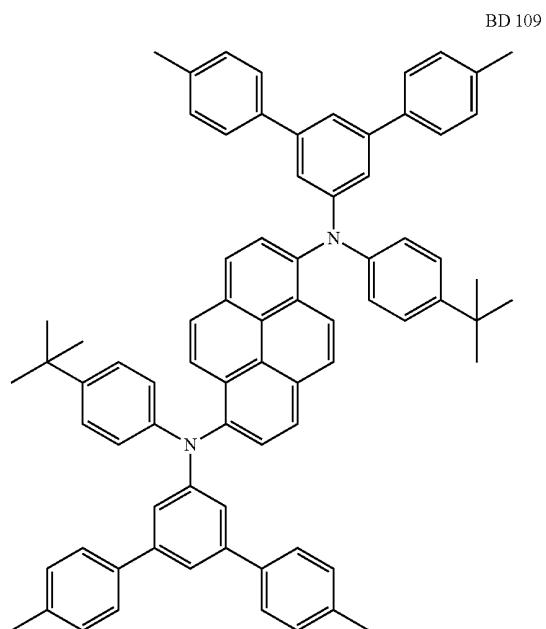
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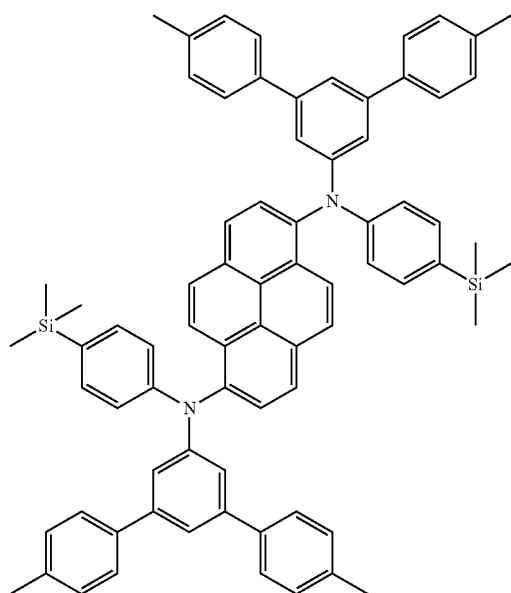


BD 108

BD 110

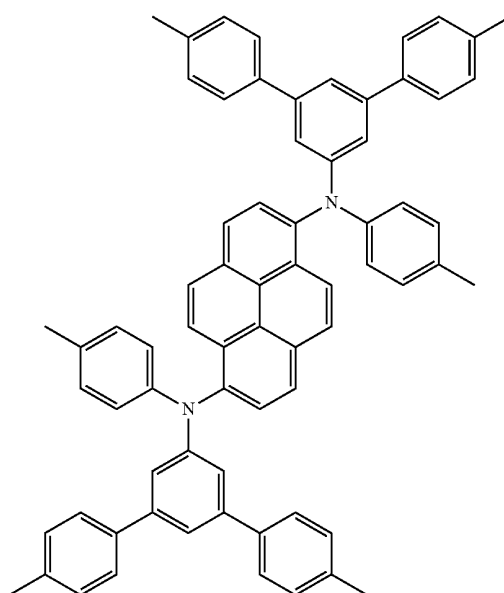
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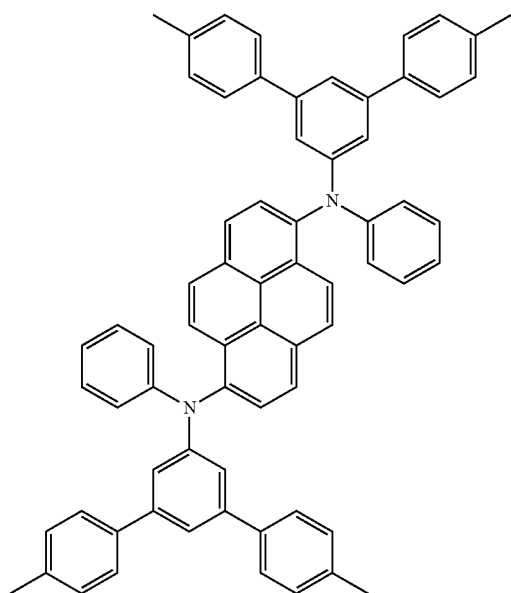


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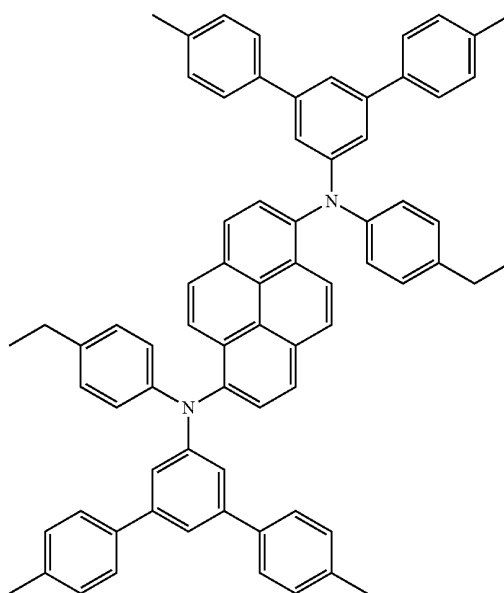
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BD 112

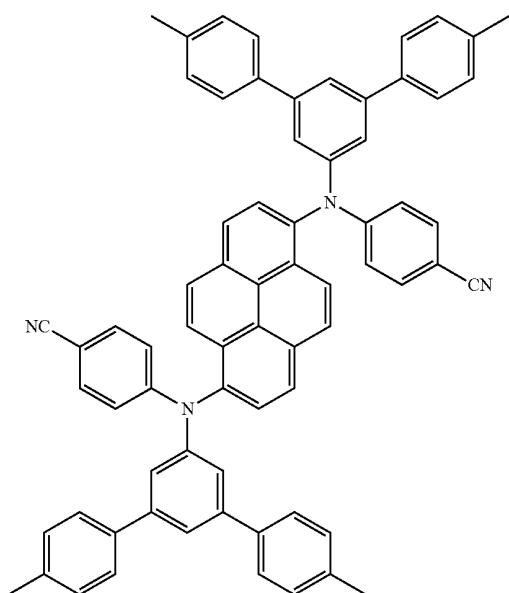


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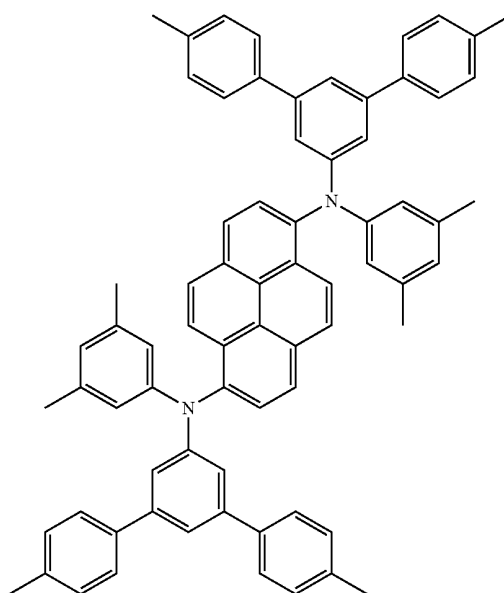
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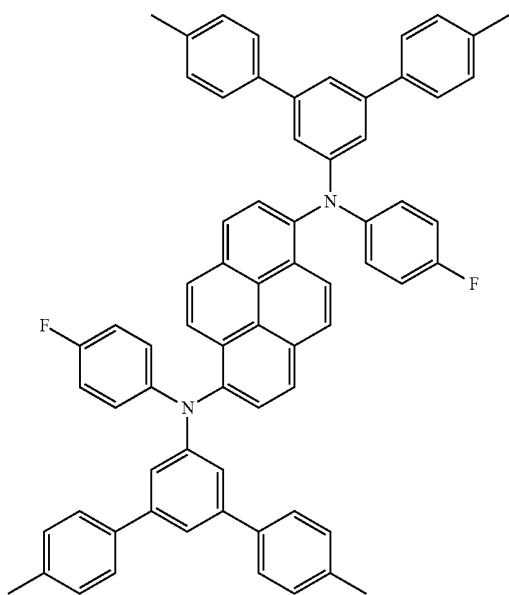


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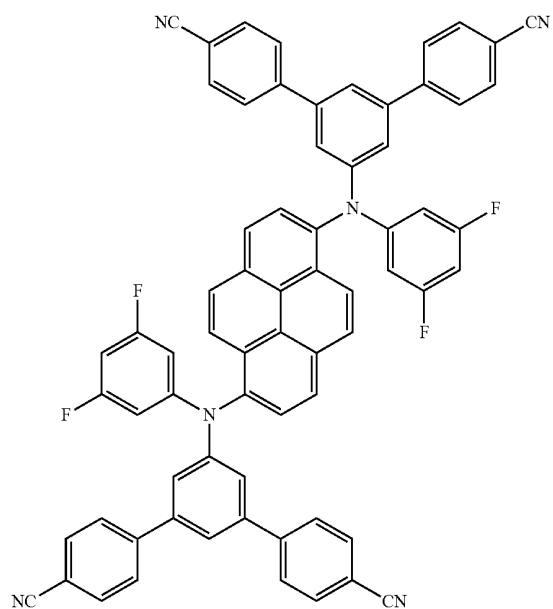
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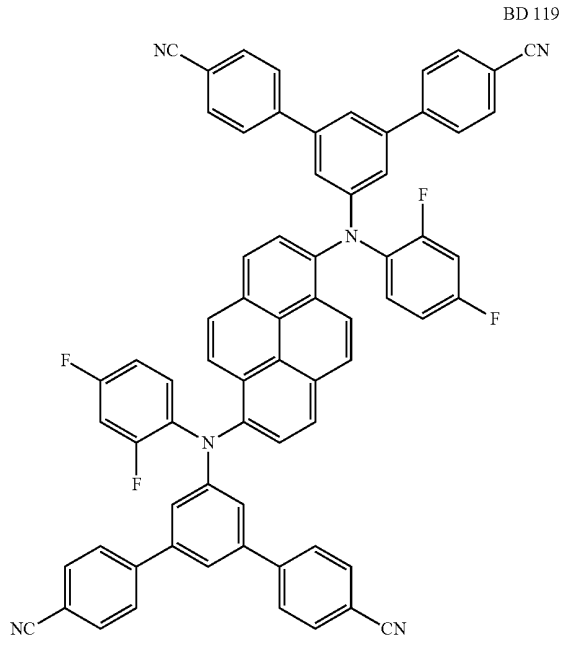
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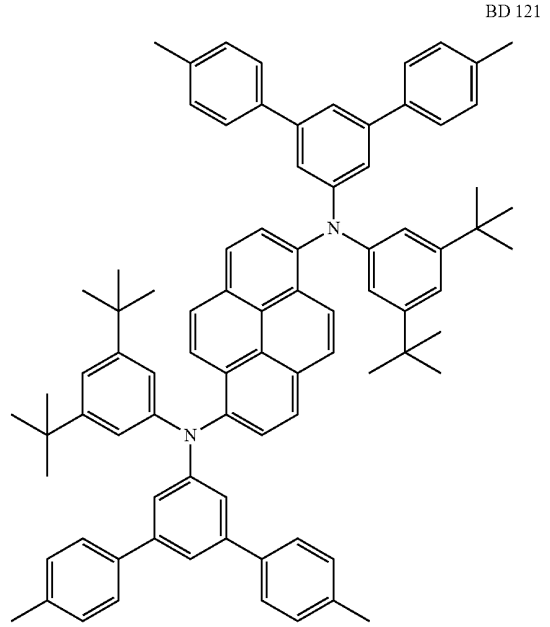
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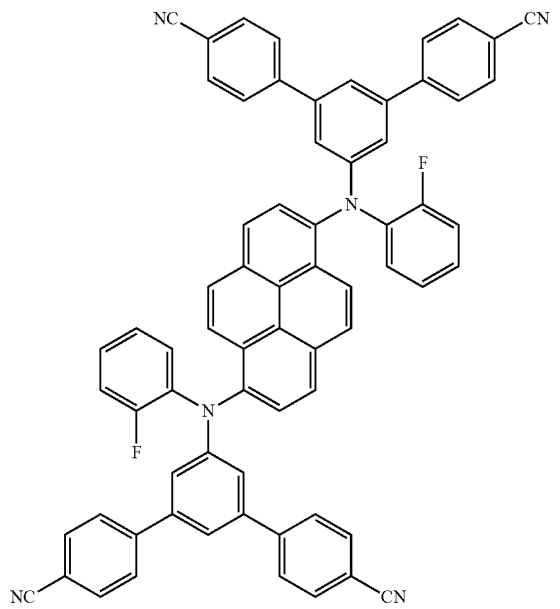
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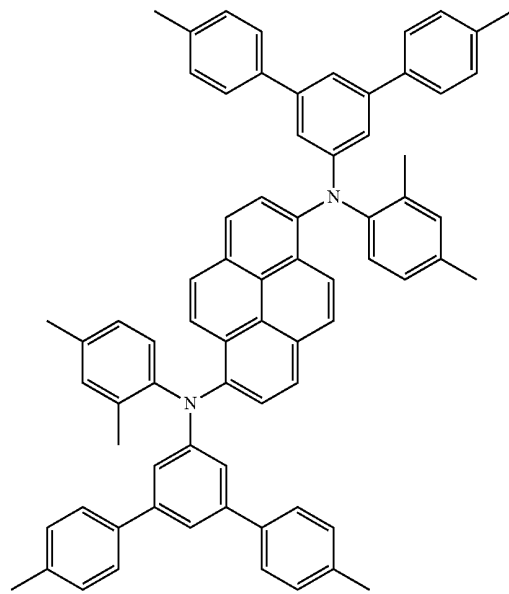
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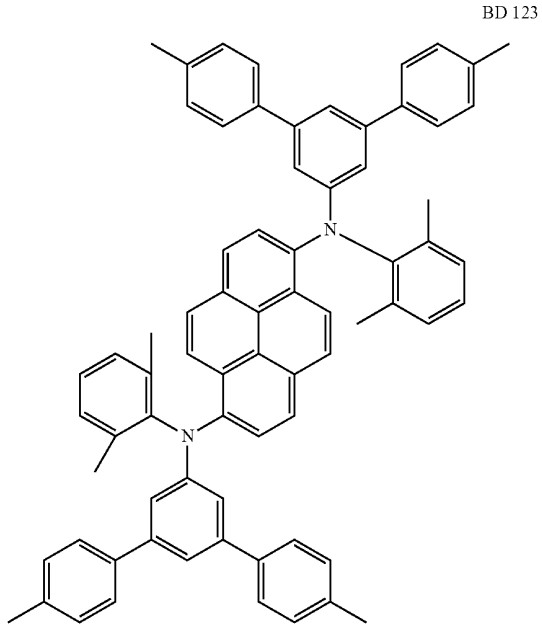
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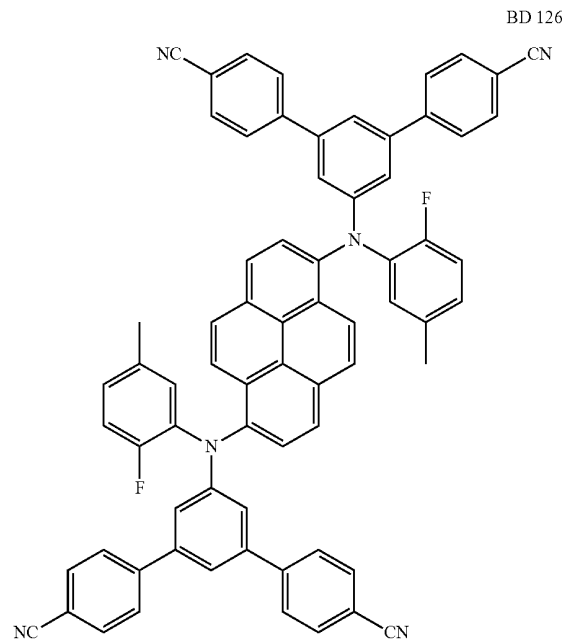
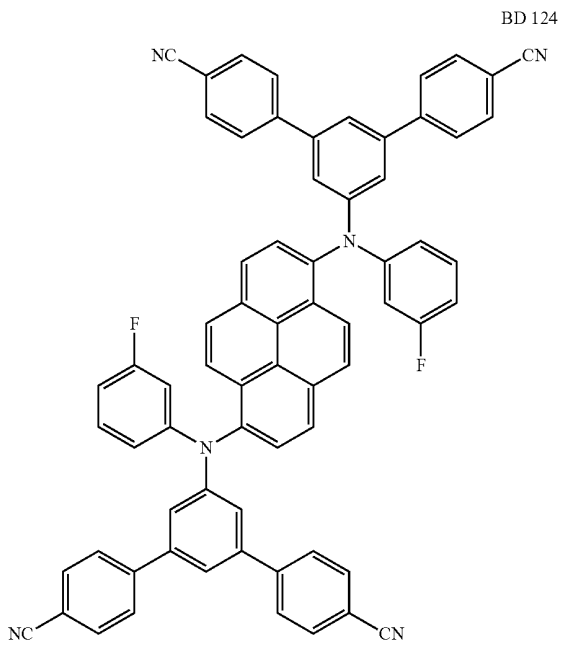
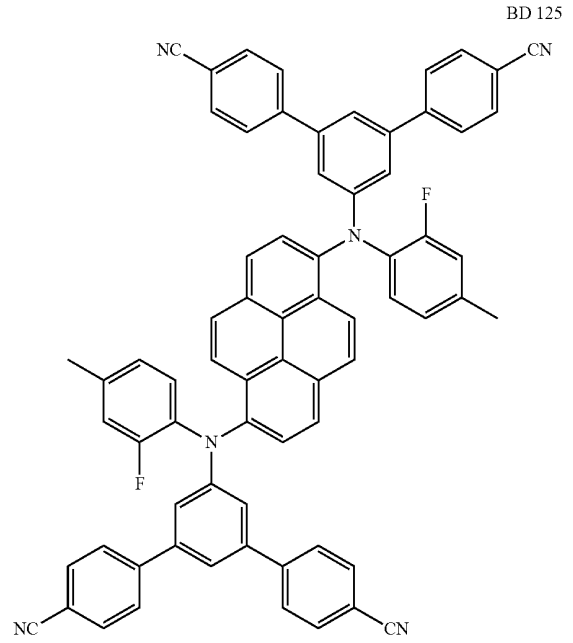
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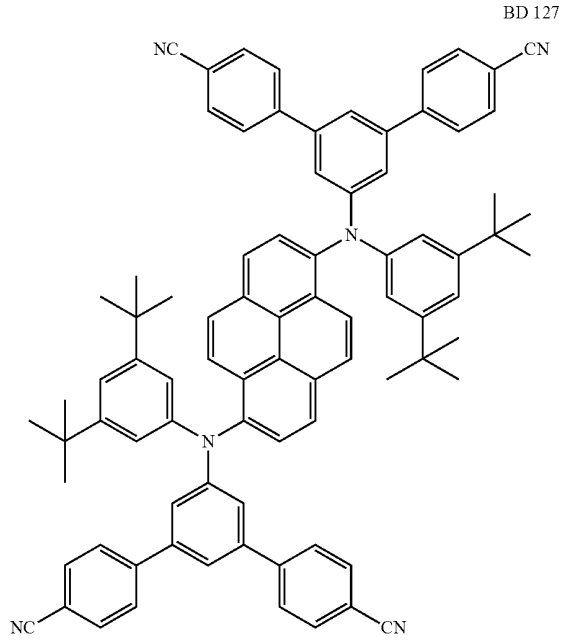
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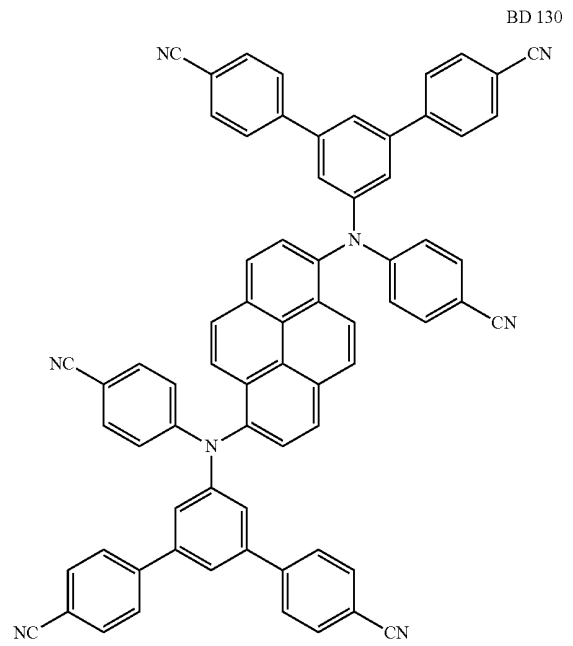
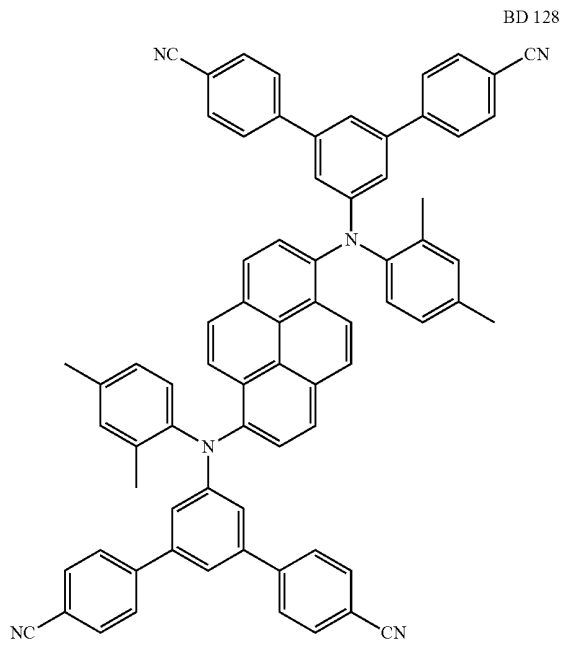
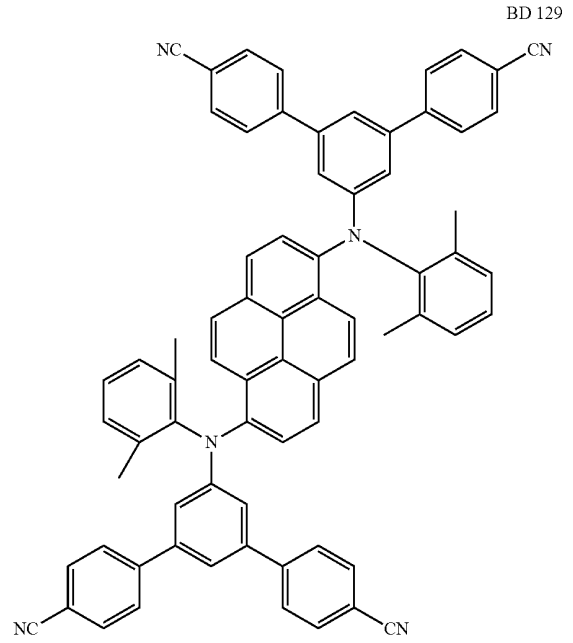
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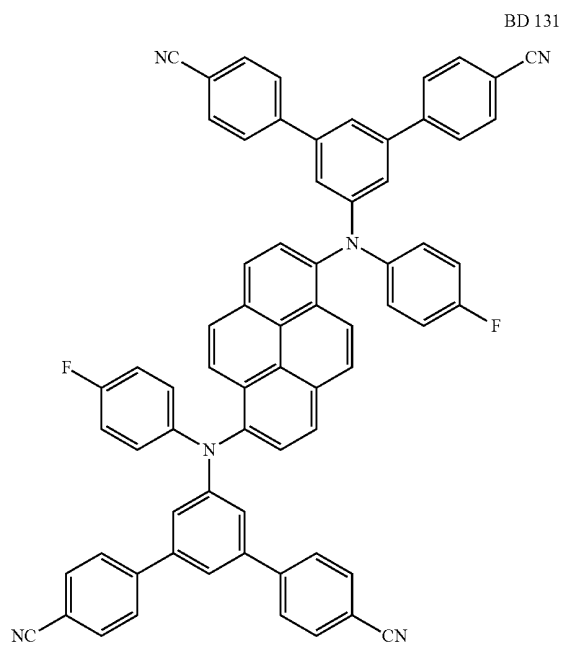
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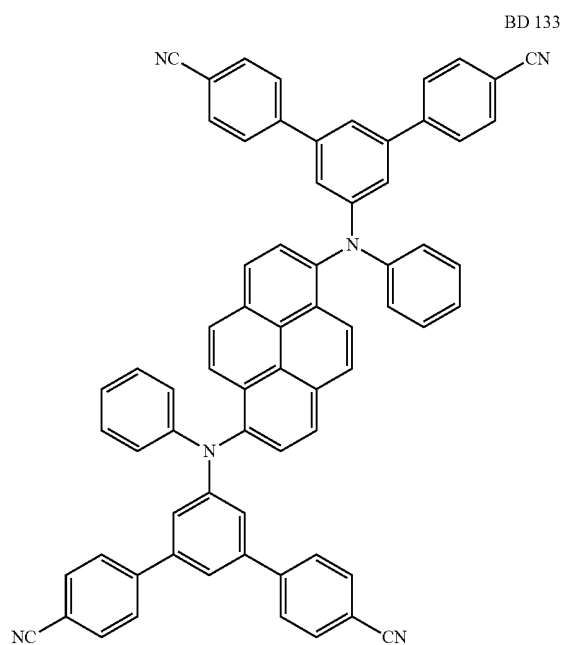
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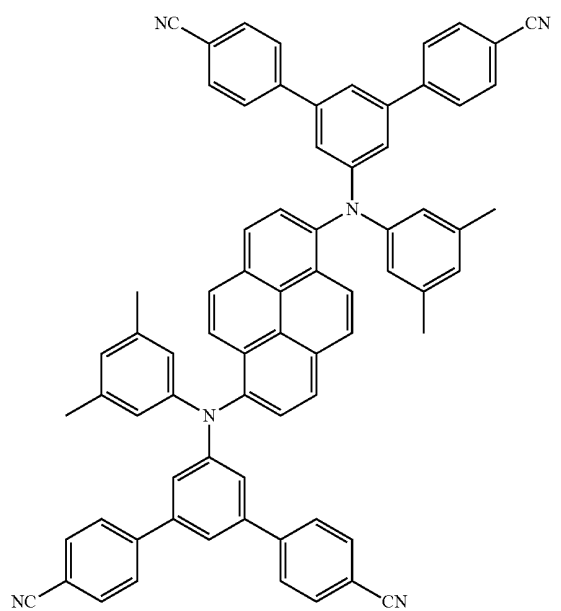
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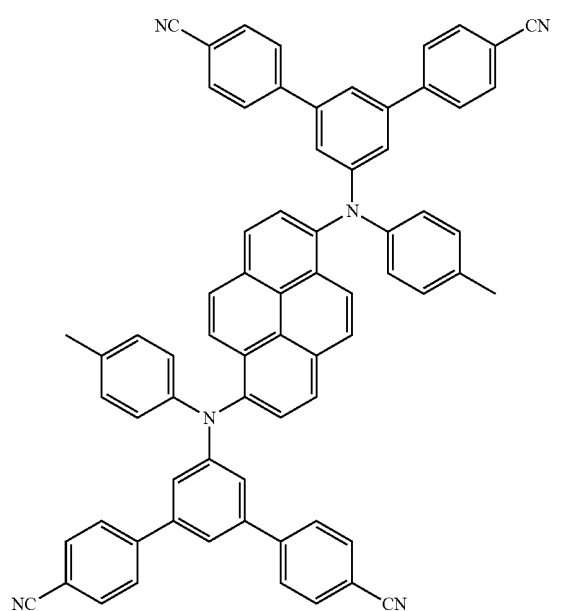
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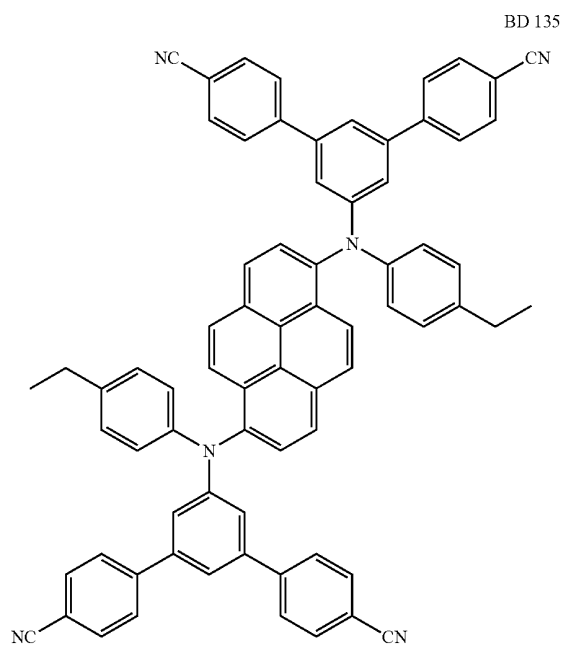
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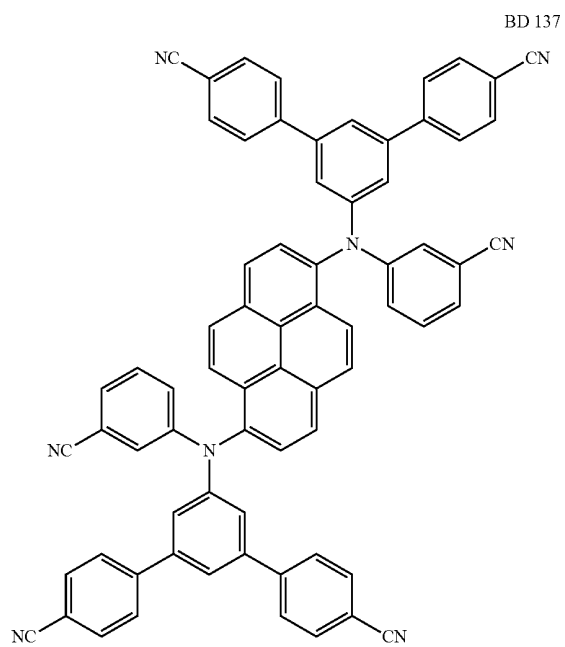
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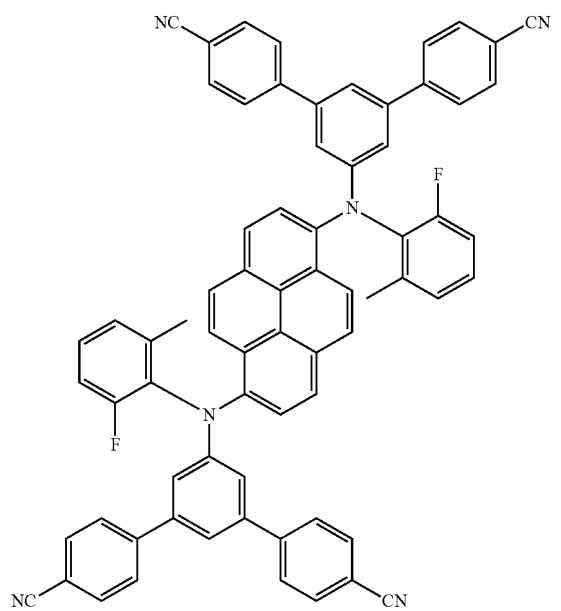
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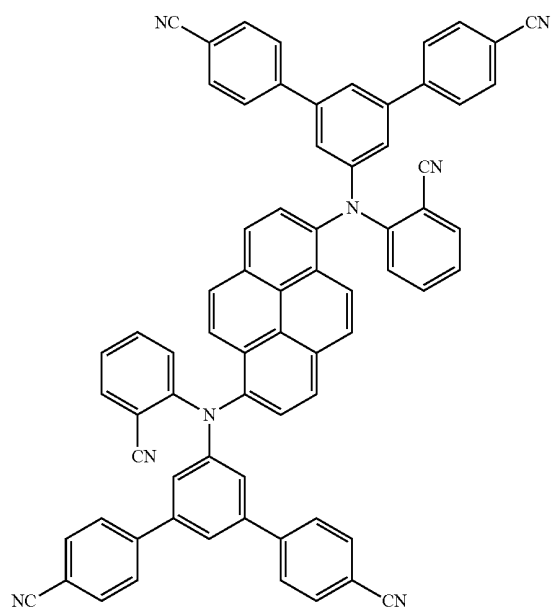
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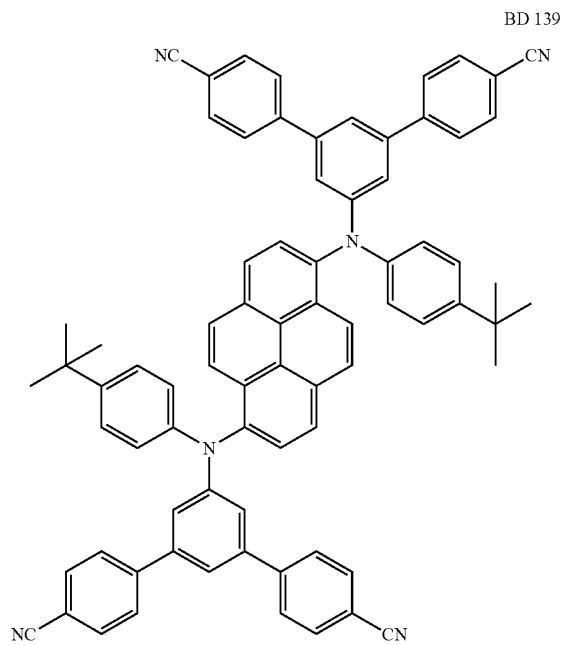
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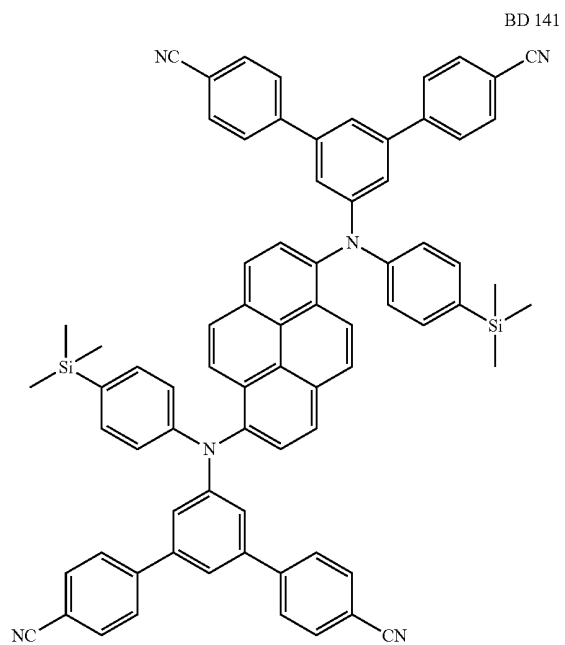
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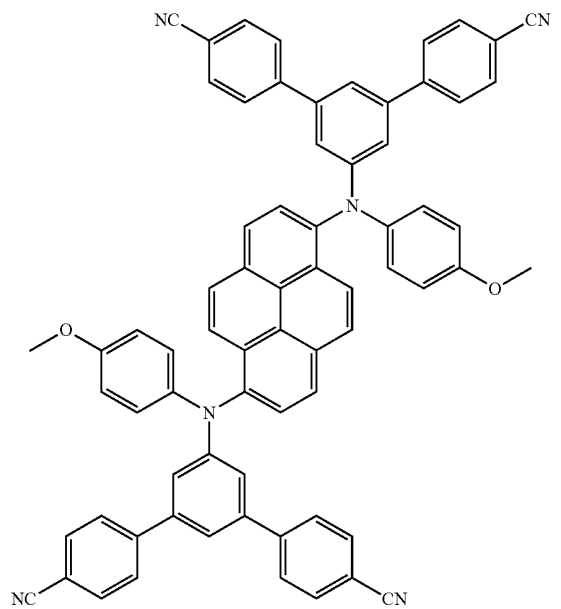
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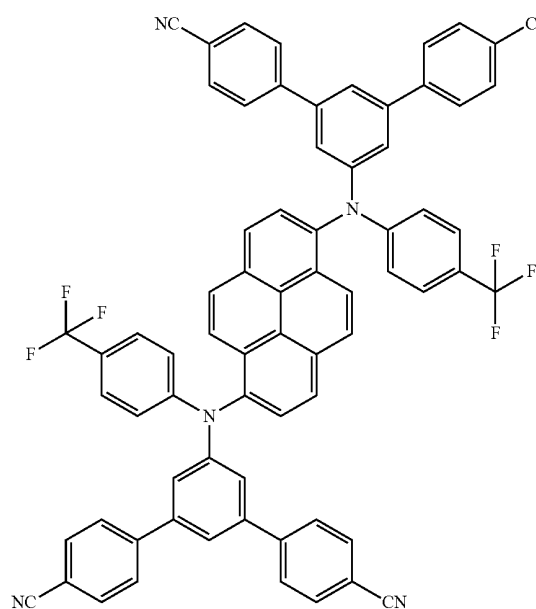
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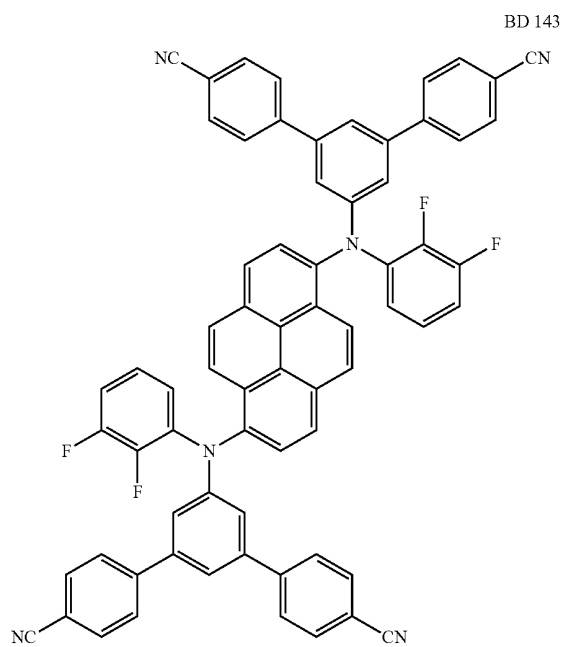
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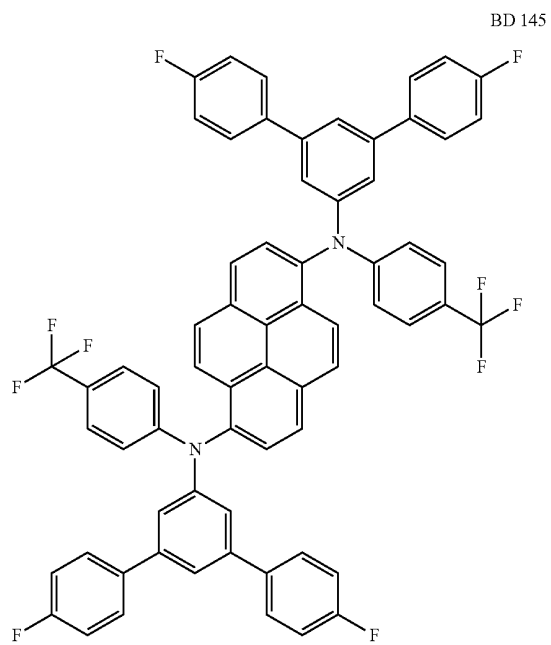
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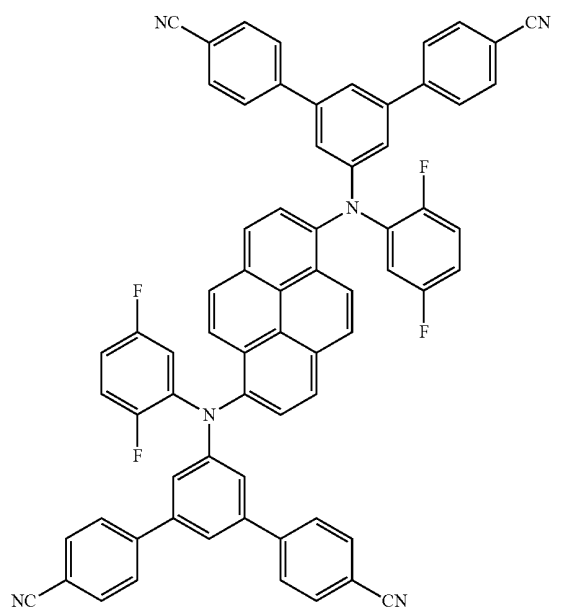
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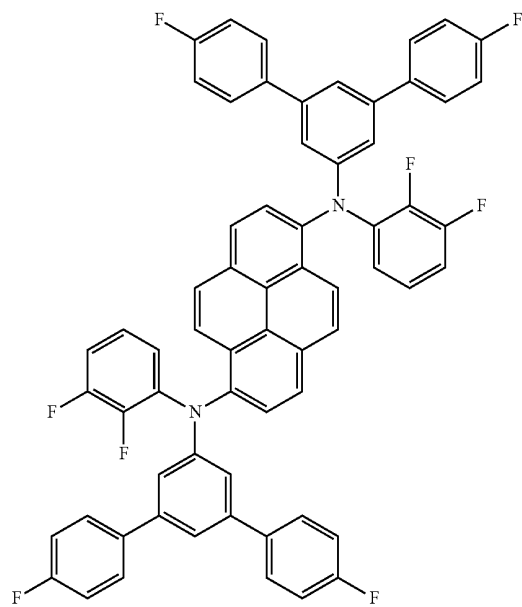
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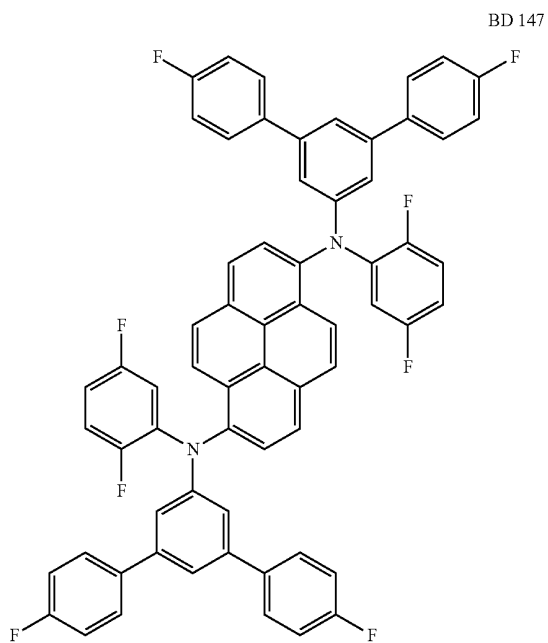
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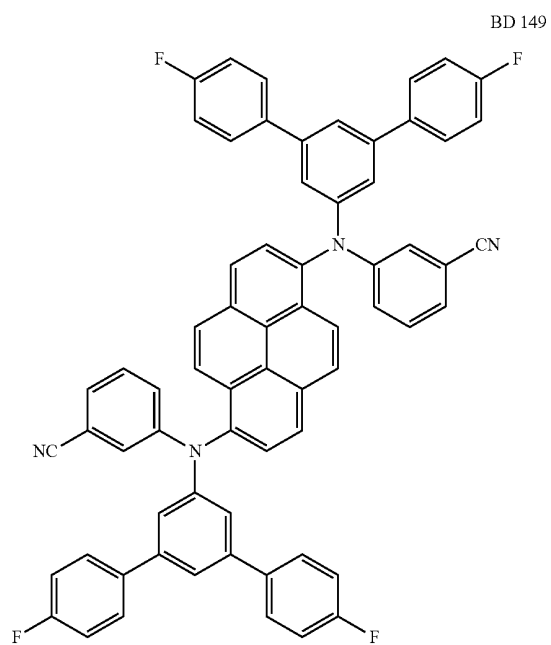
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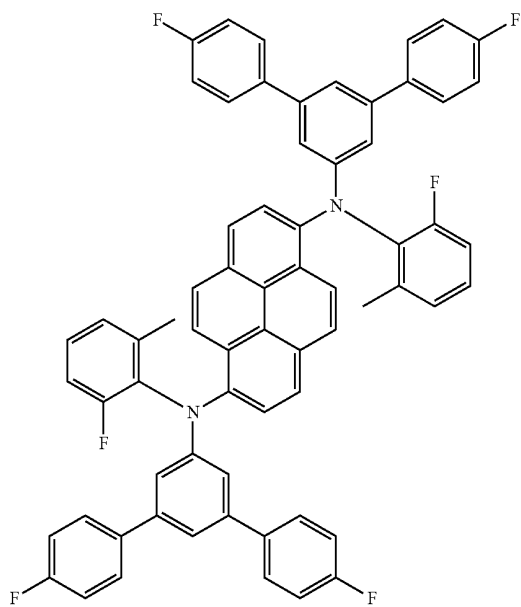
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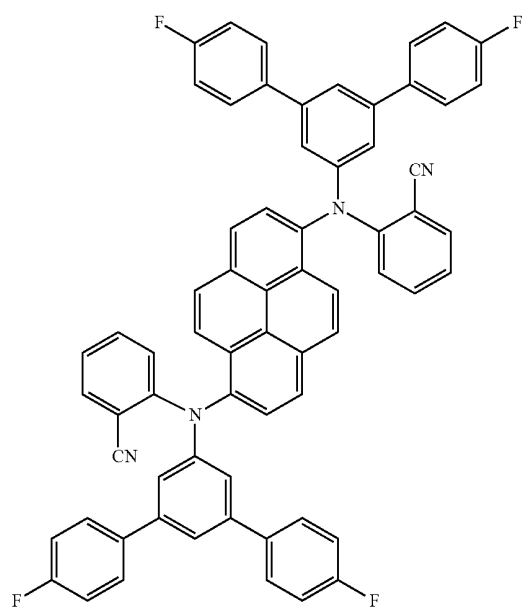
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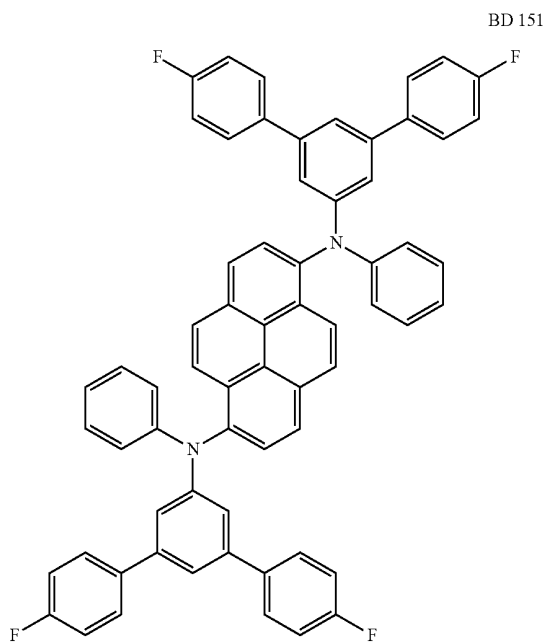
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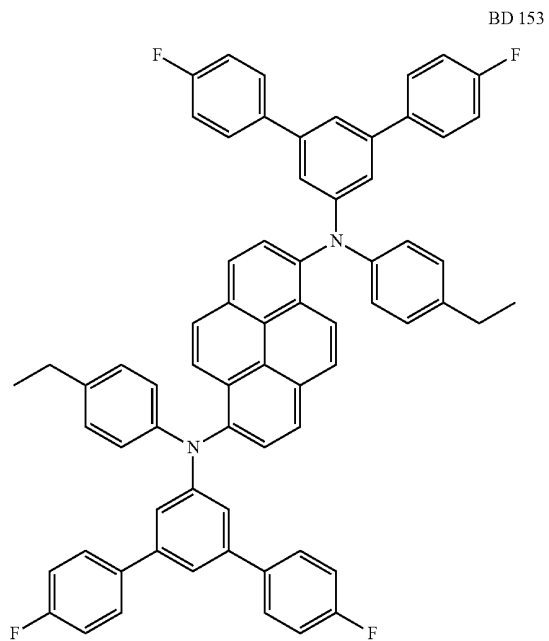
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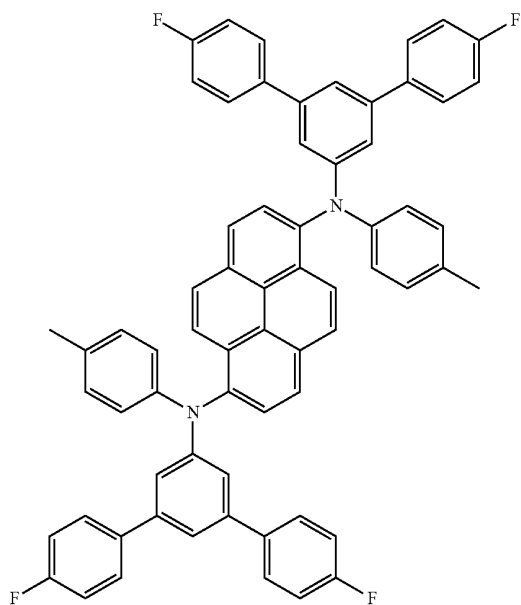
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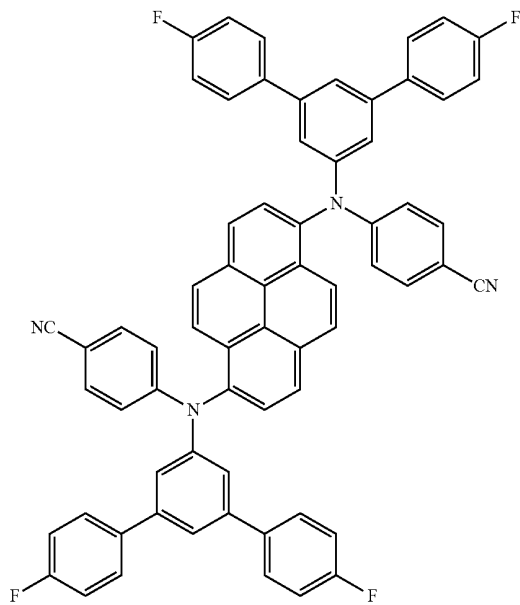
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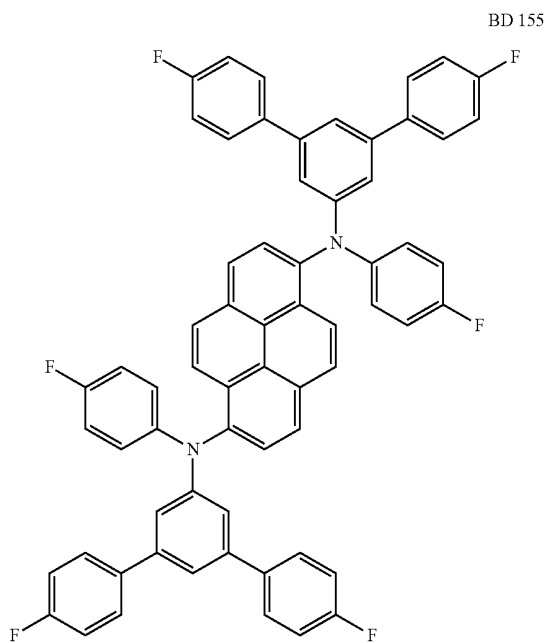
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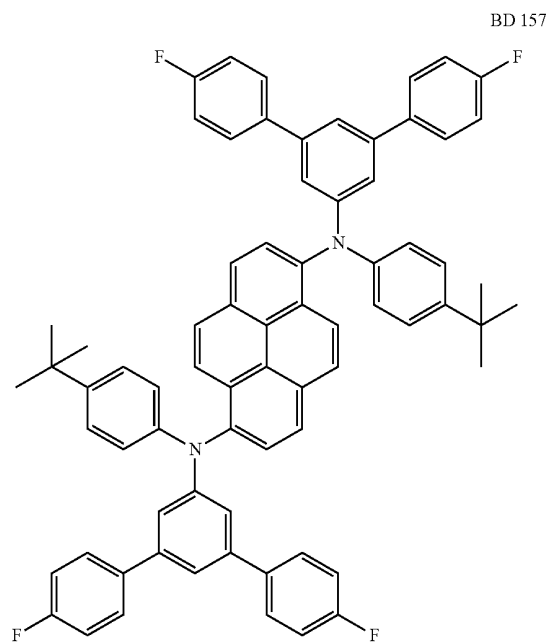
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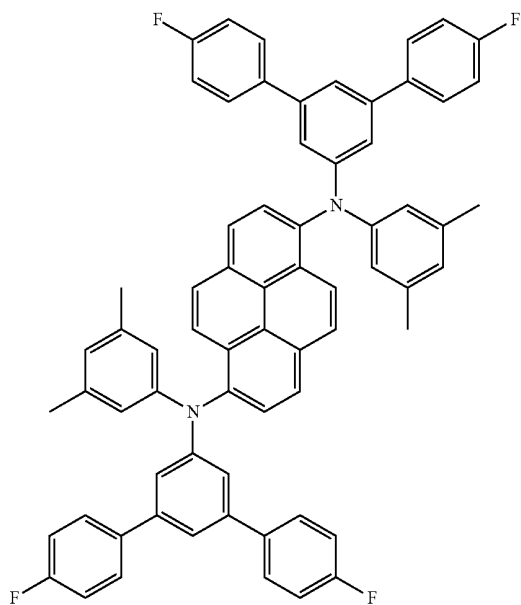
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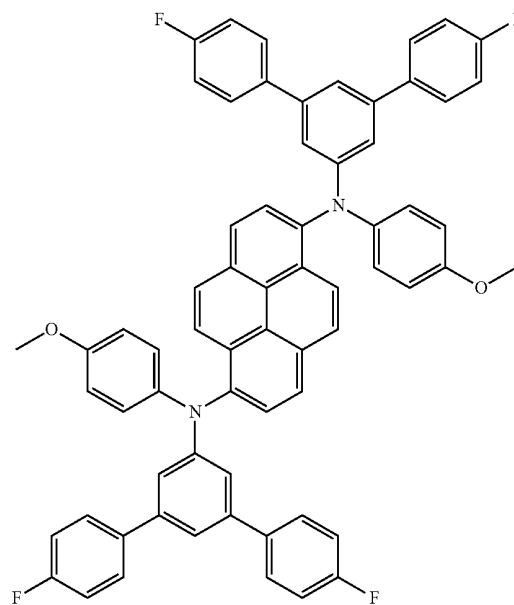
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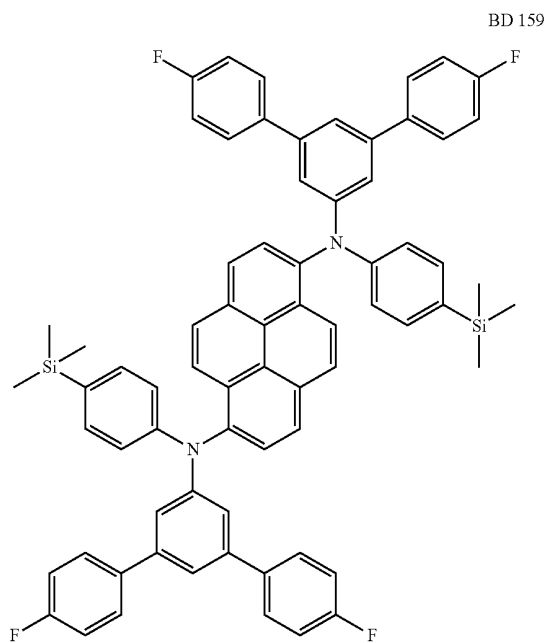
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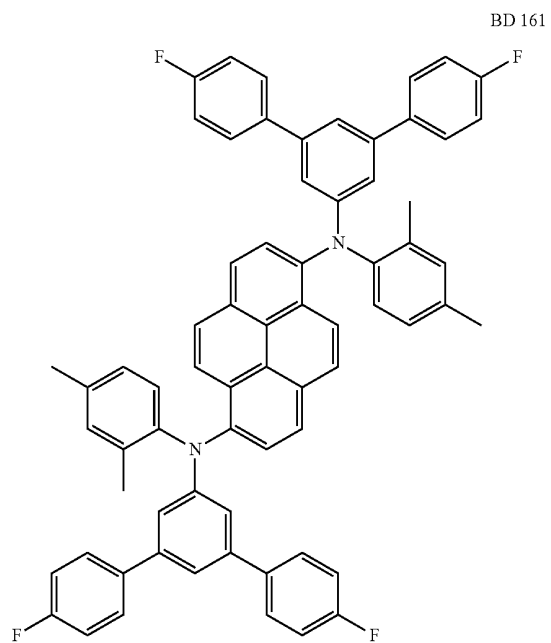
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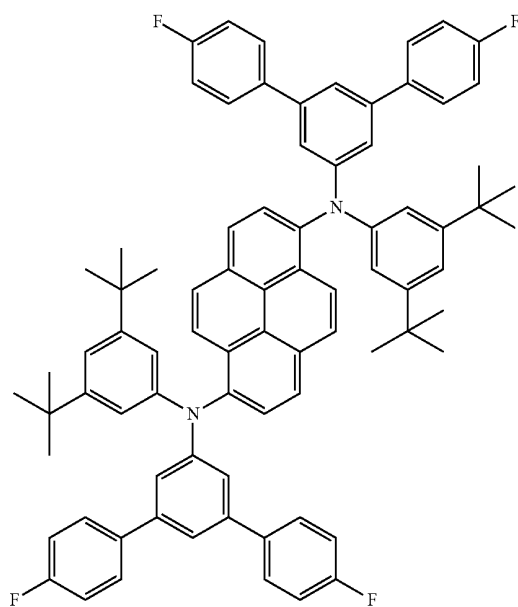
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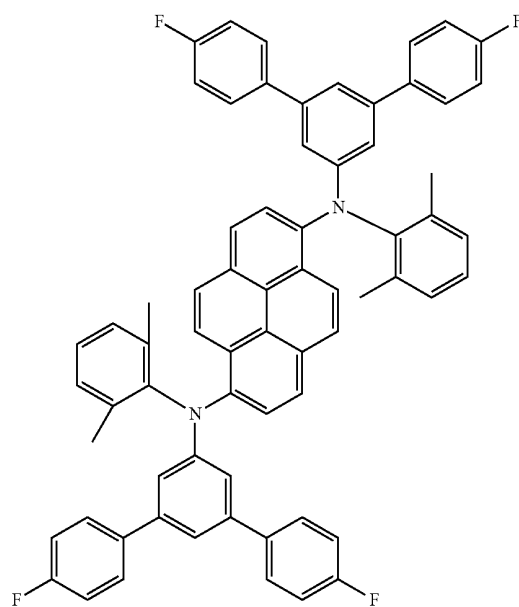
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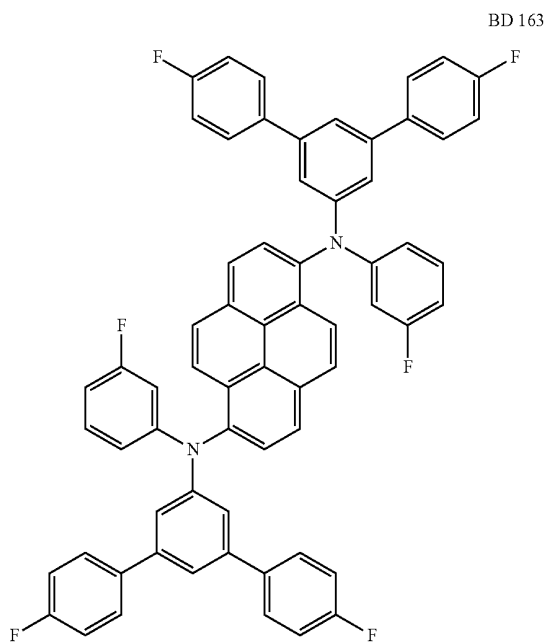
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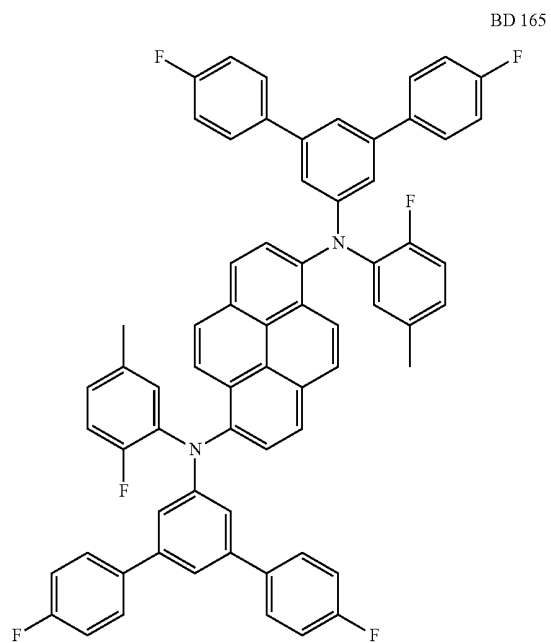
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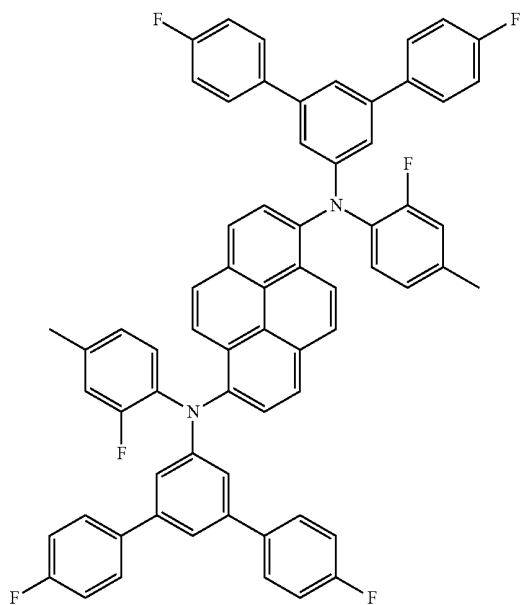
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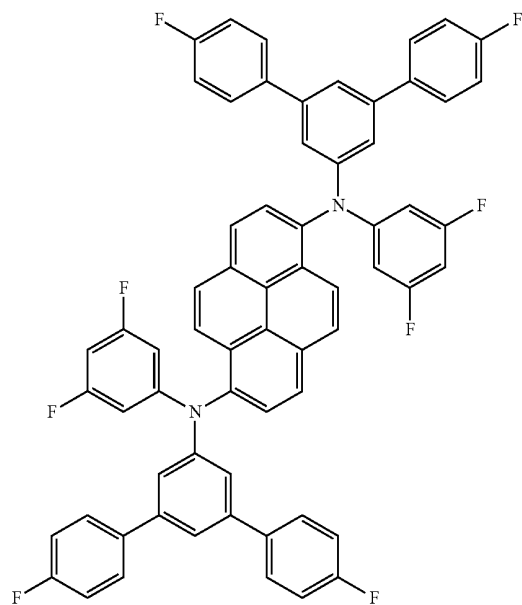
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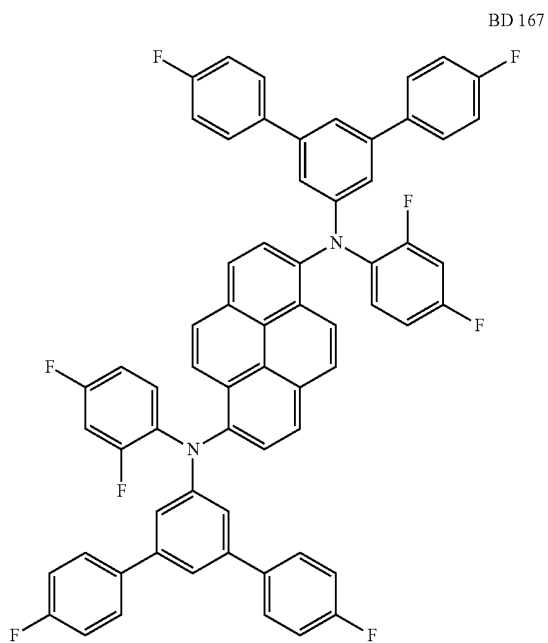
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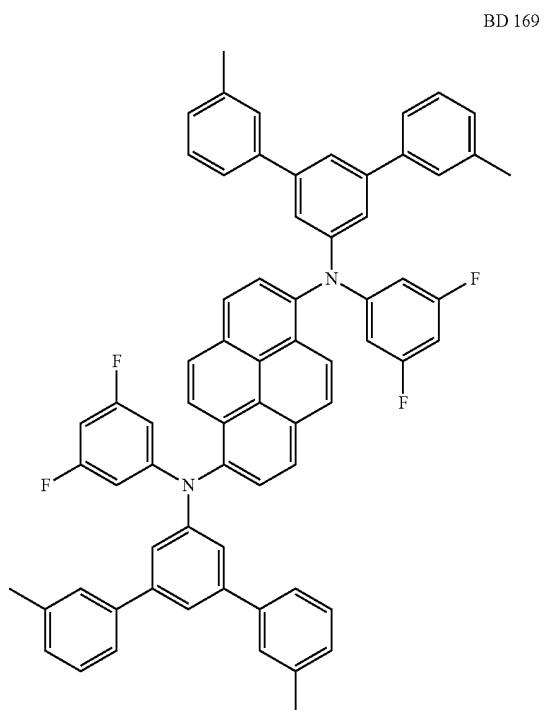
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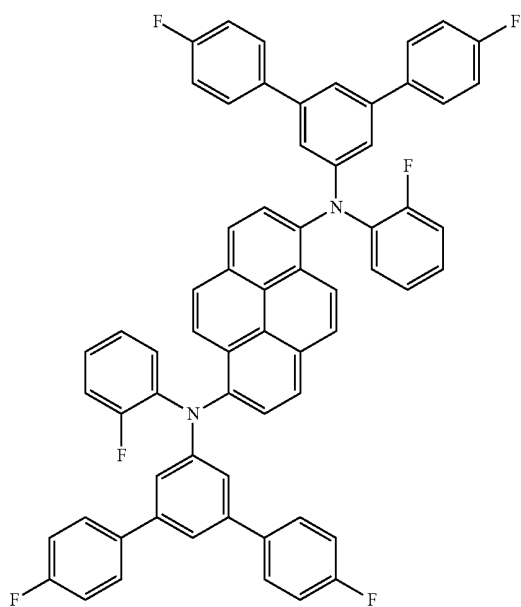
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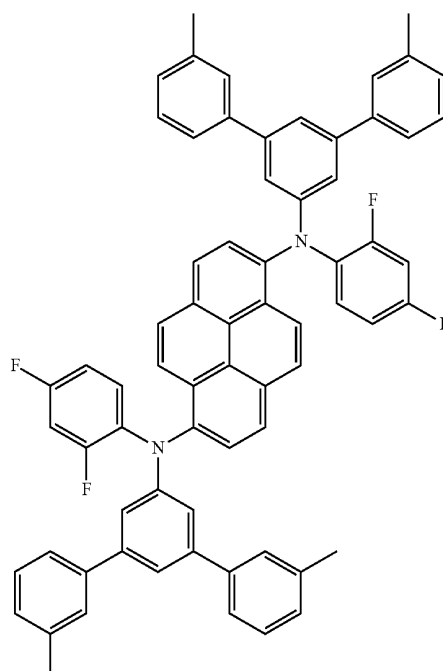
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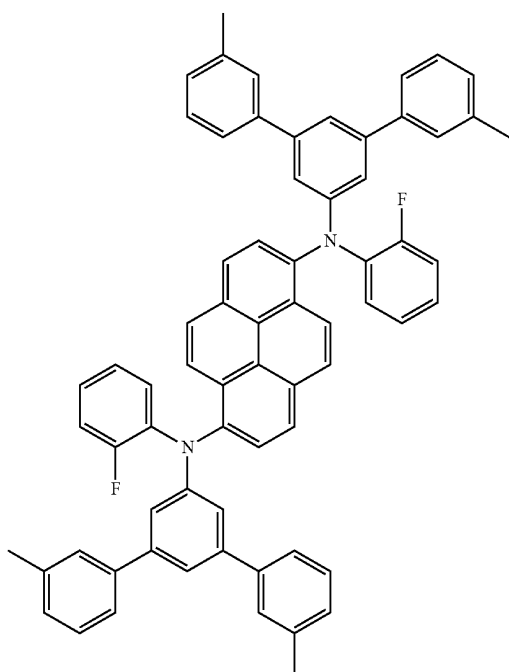


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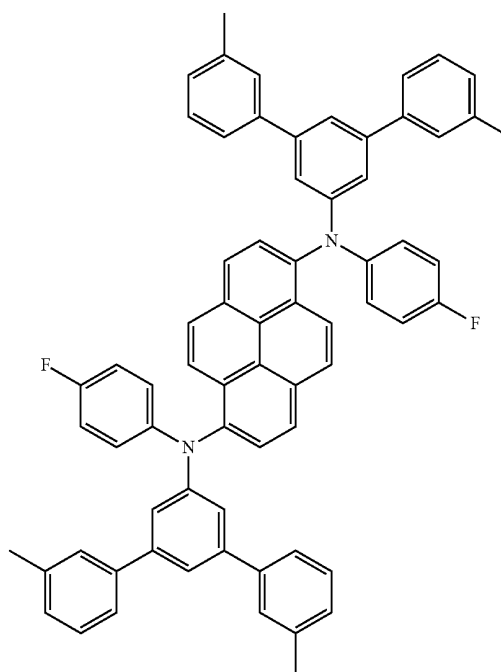
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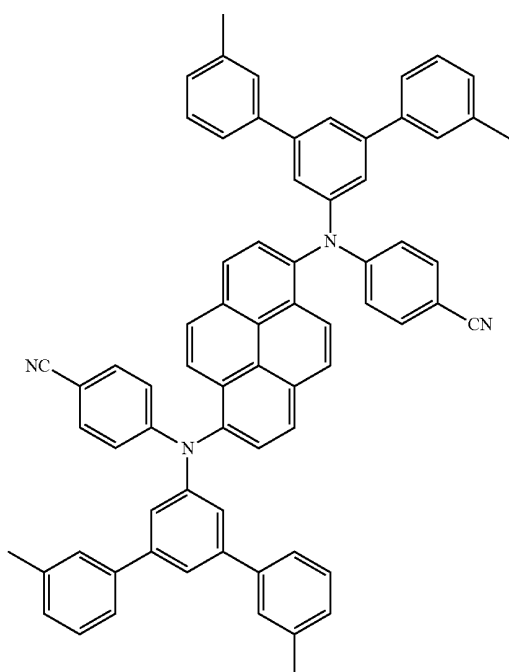


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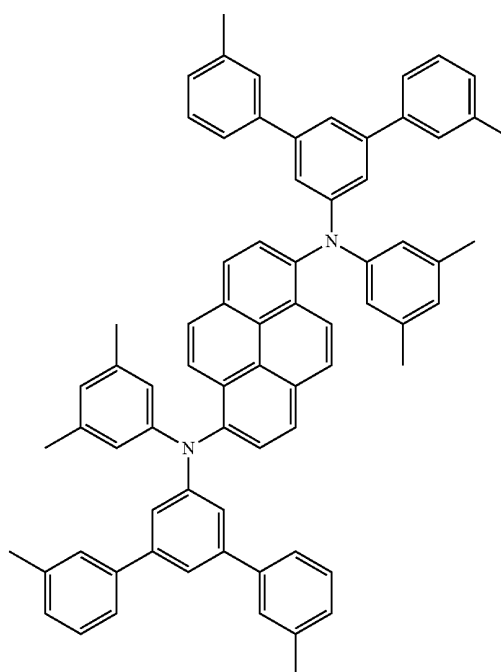
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BD 172

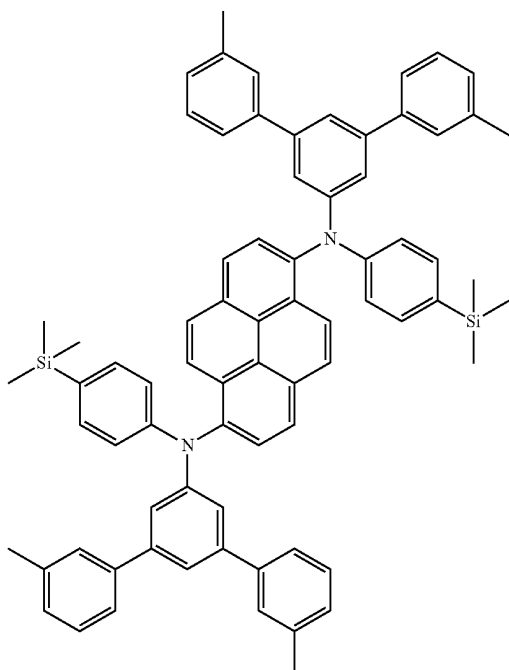


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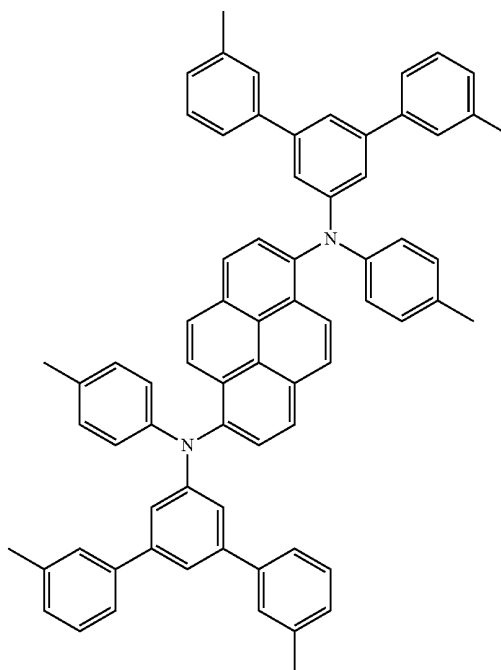
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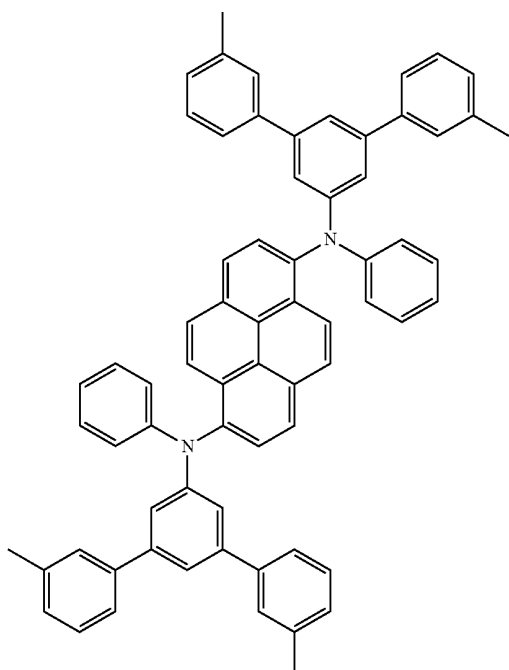


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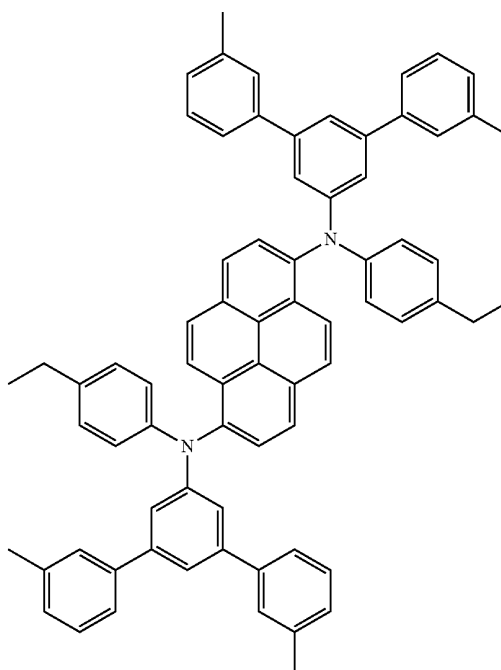
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BD 184

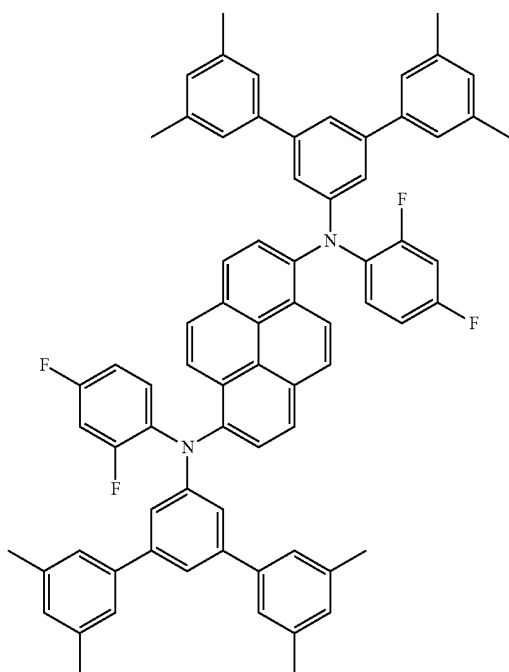


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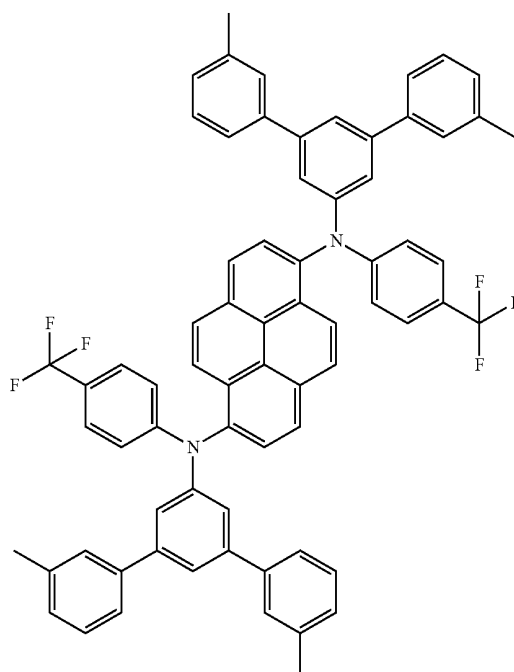
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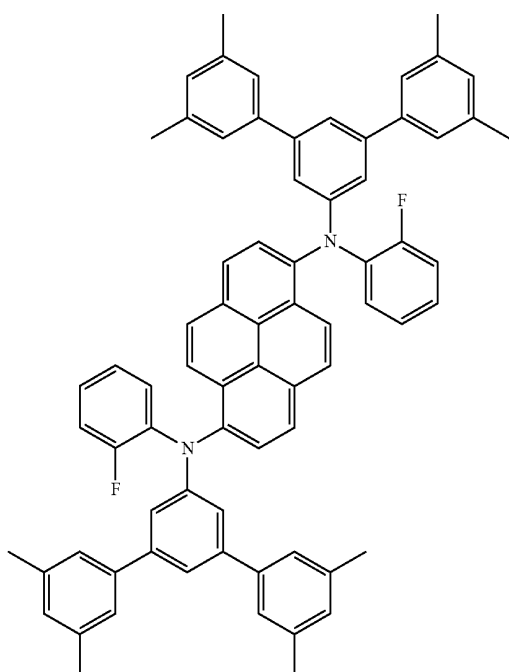


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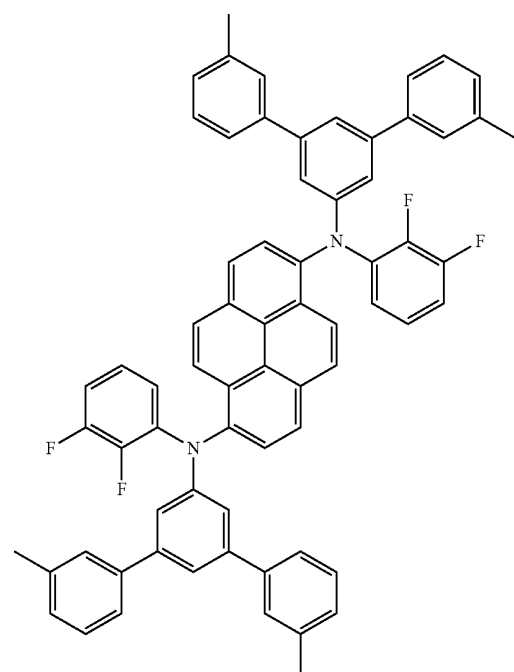
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BD 192

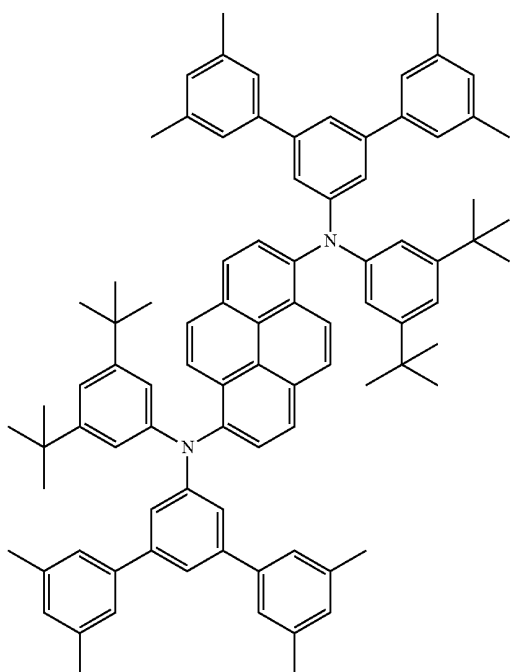


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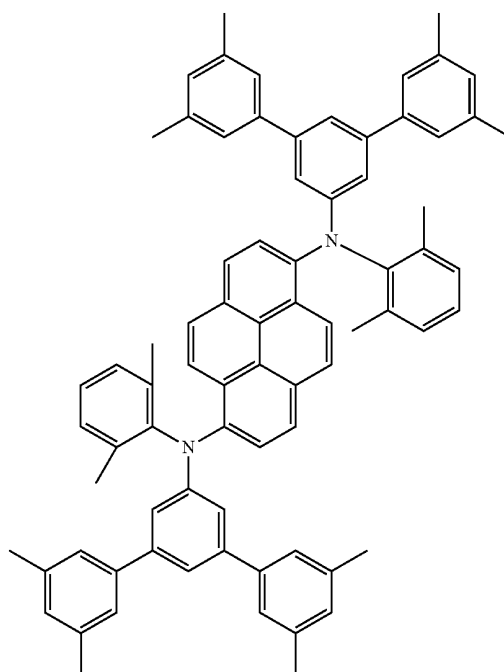
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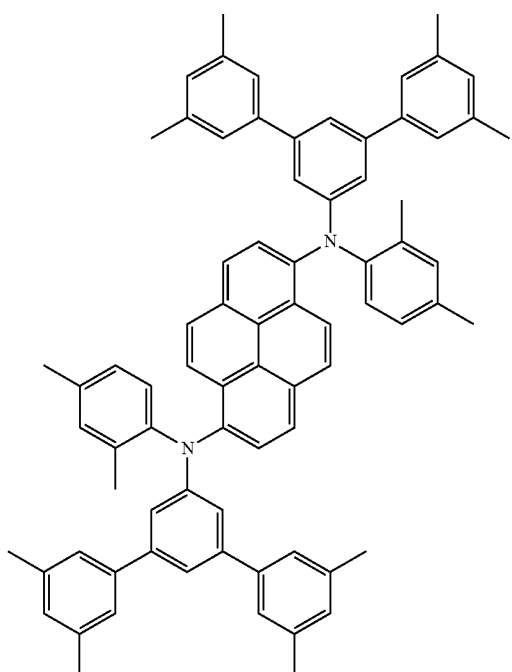


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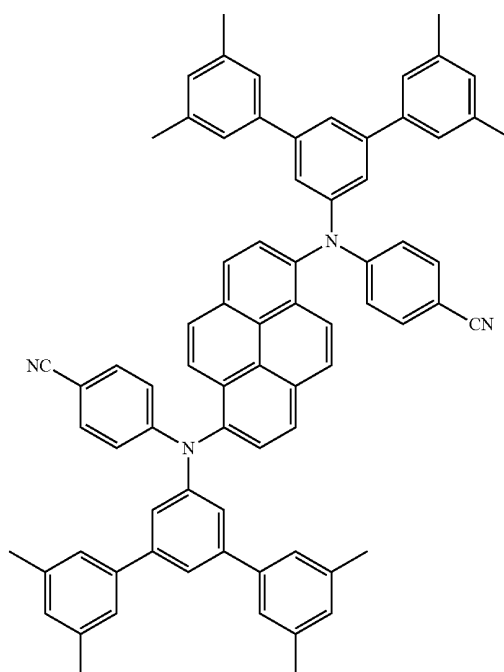
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BD 200

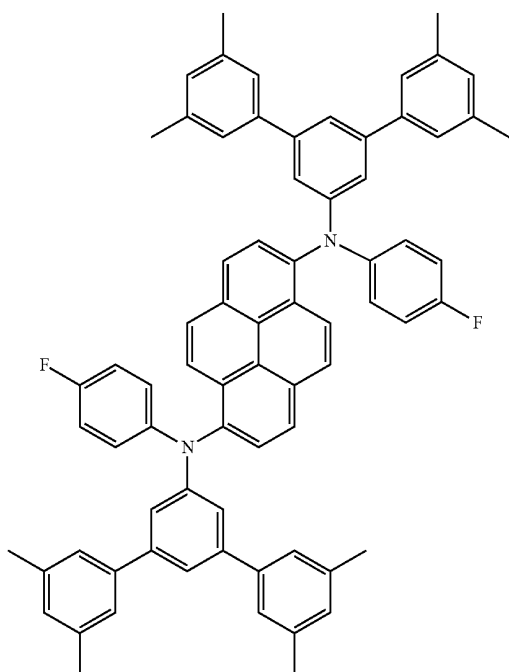


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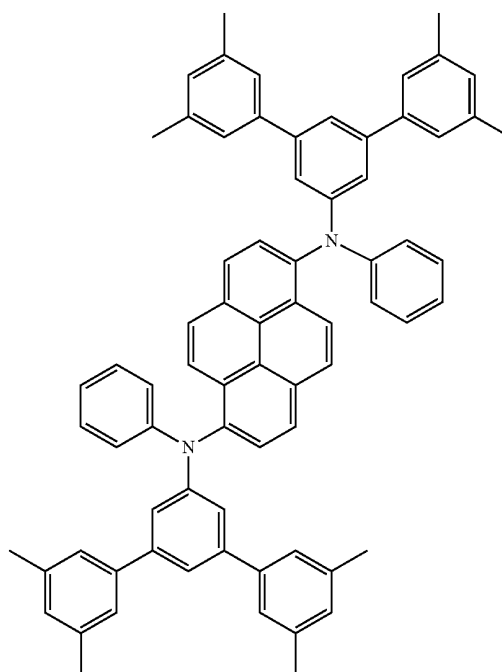
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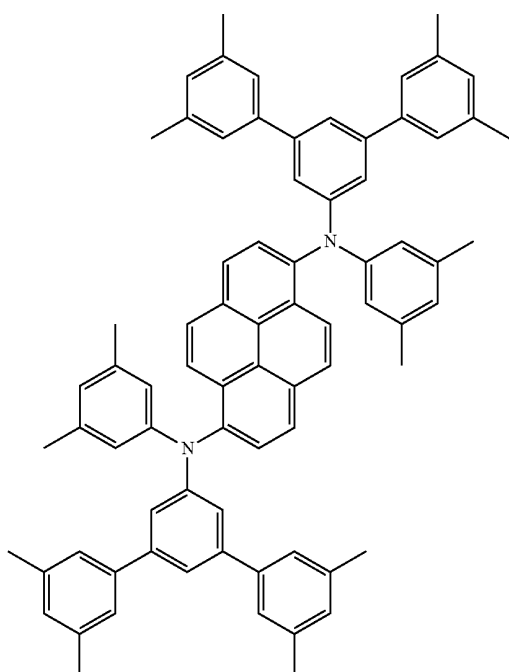


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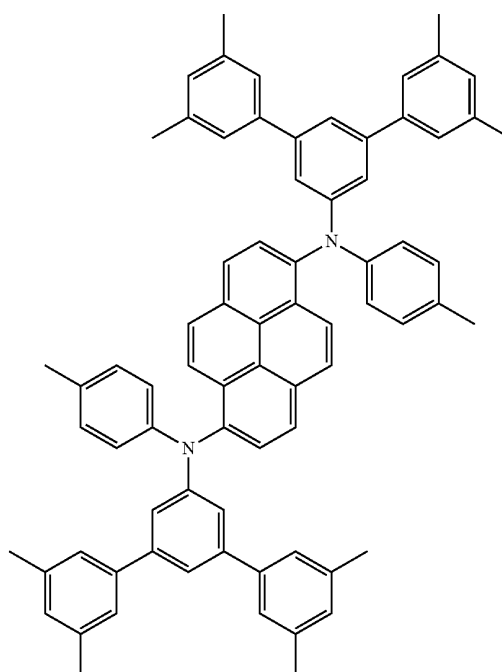
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BD 204

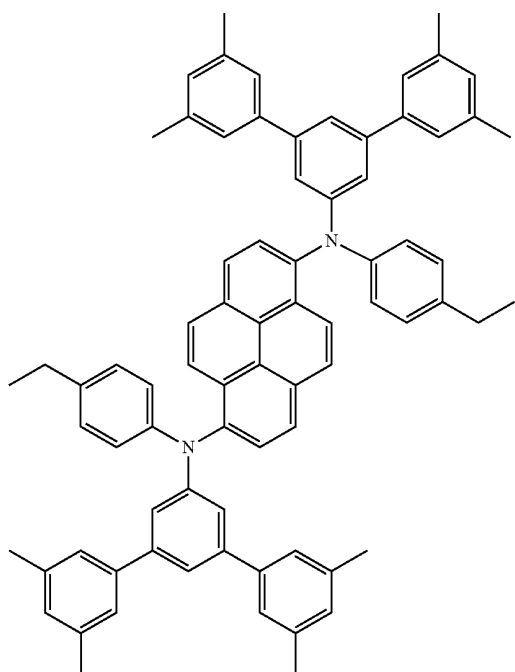


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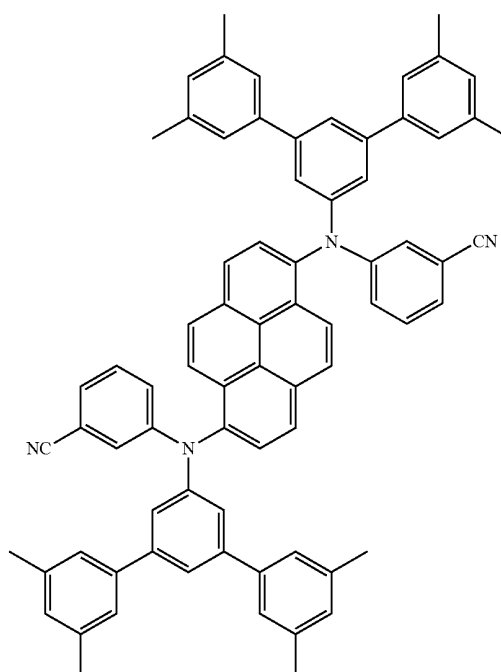
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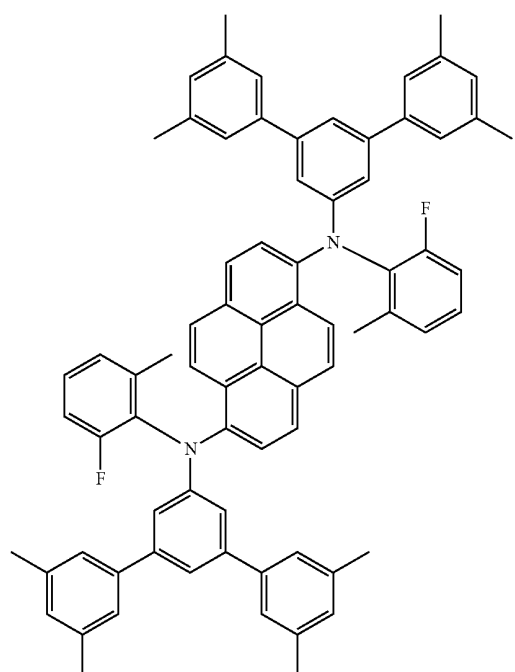


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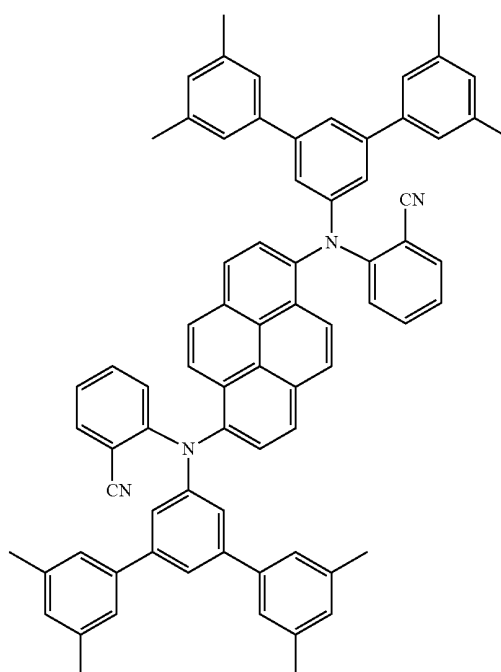
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BD 208

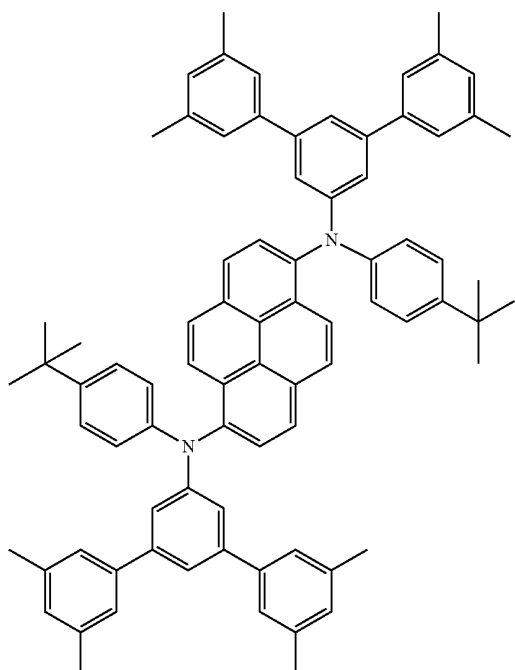


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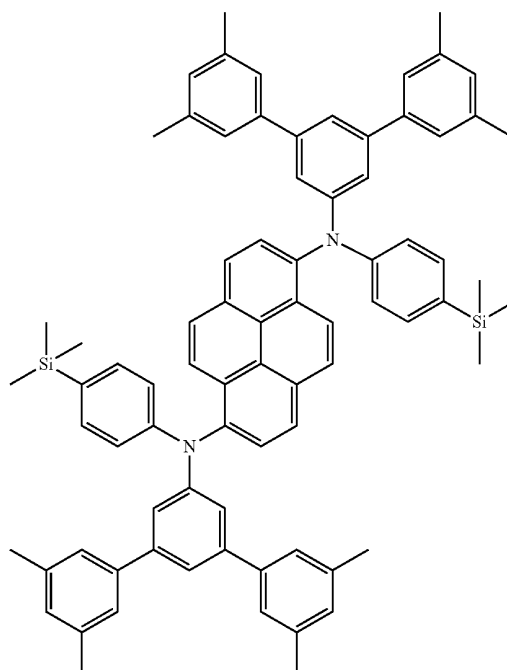
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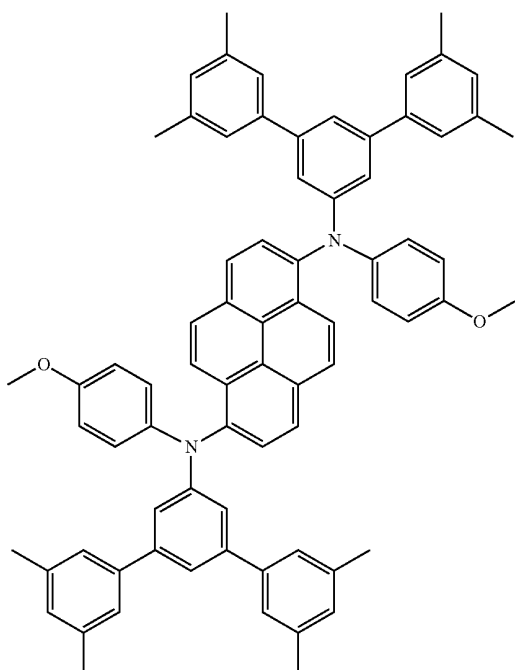


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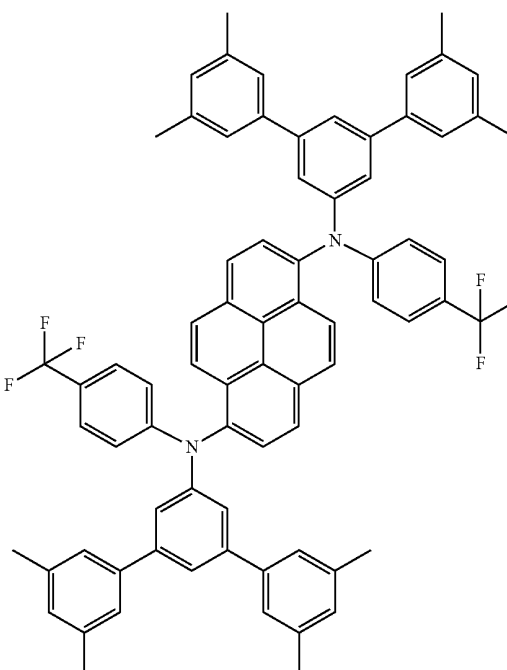
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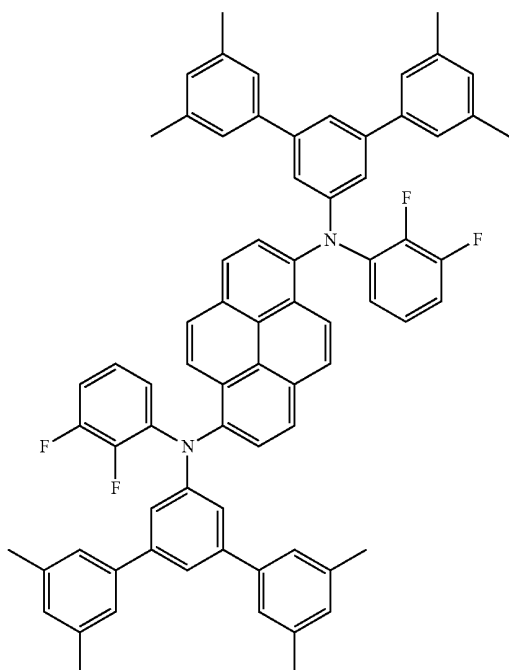


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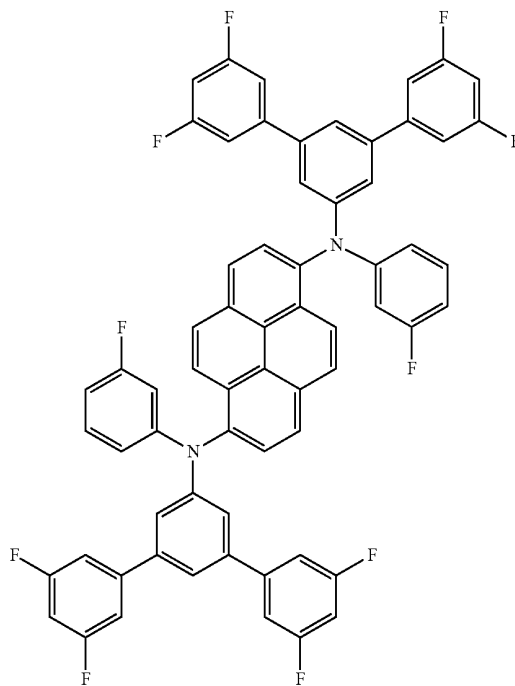
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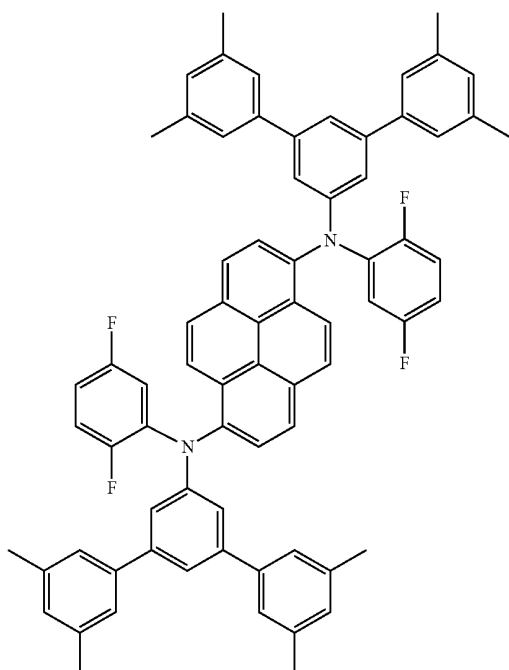


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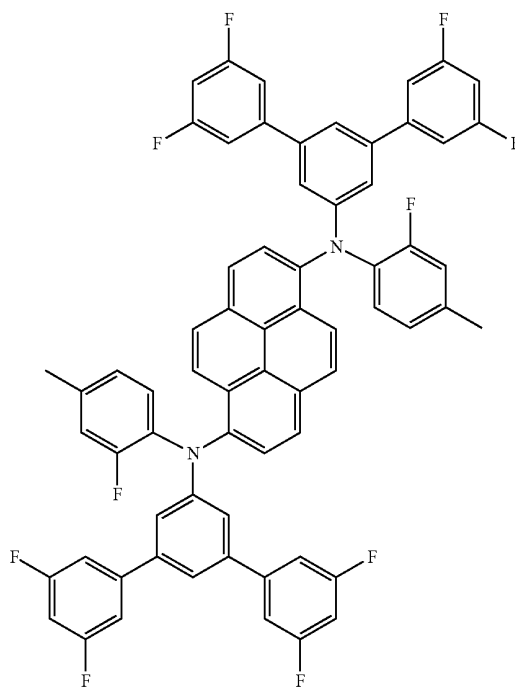
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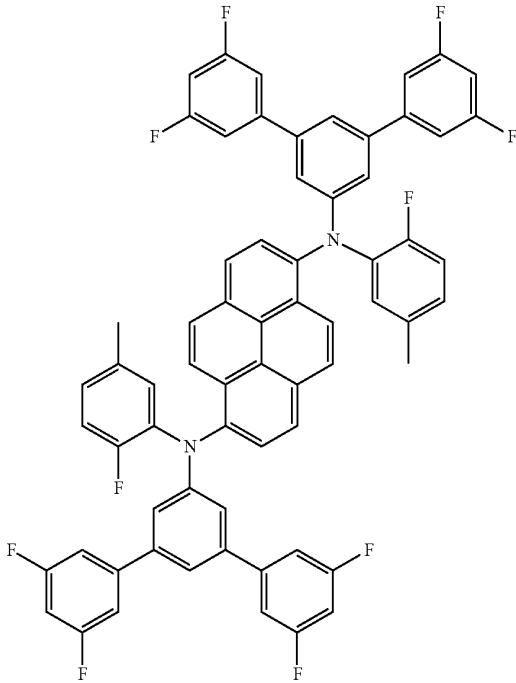


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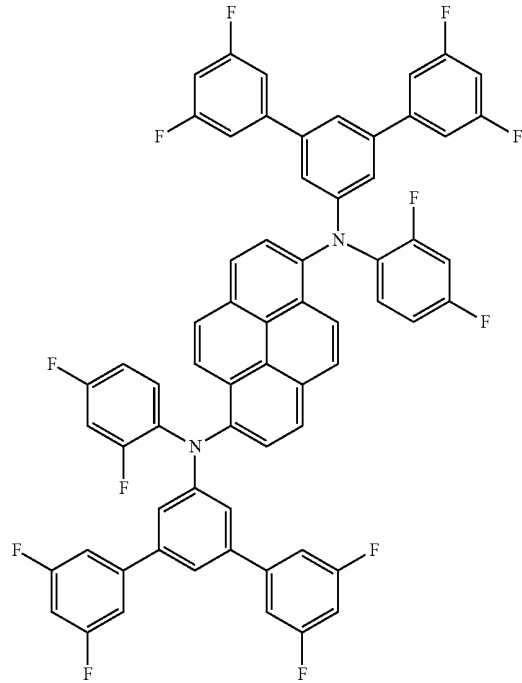
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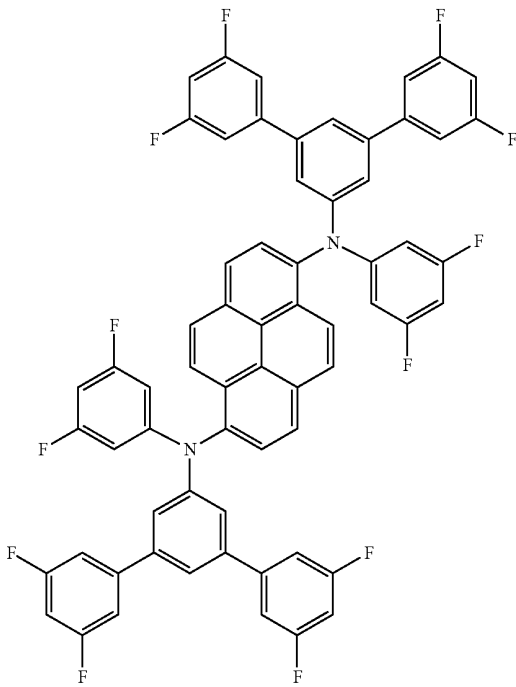


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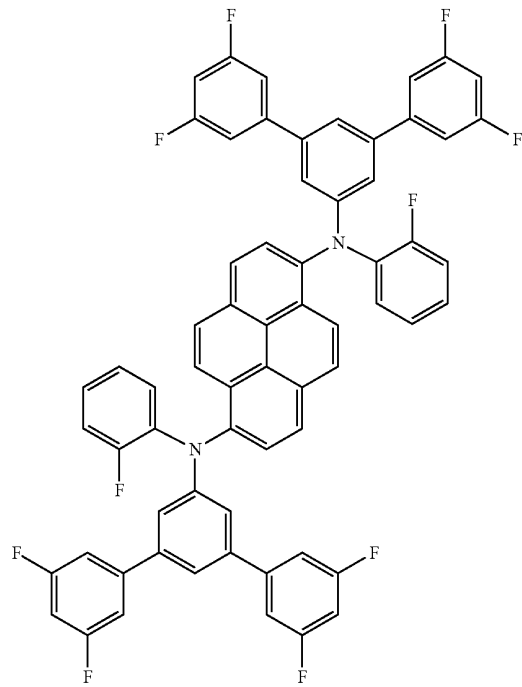
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BD 220

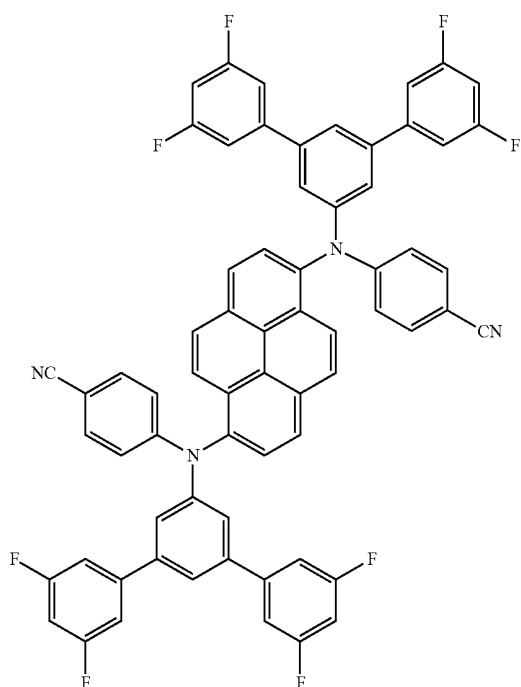


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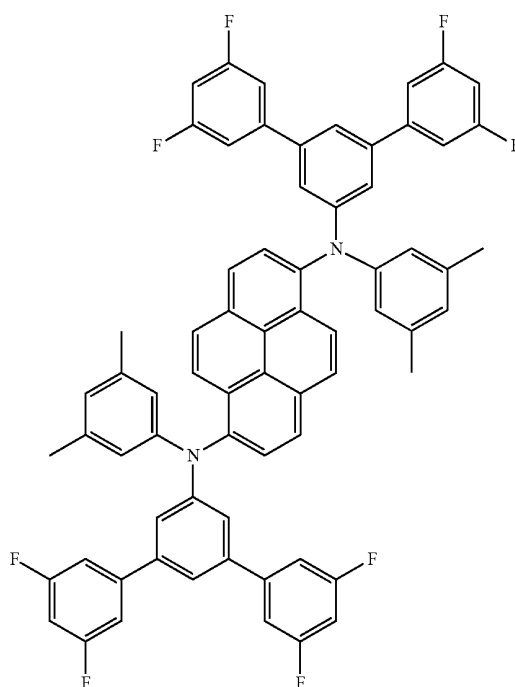
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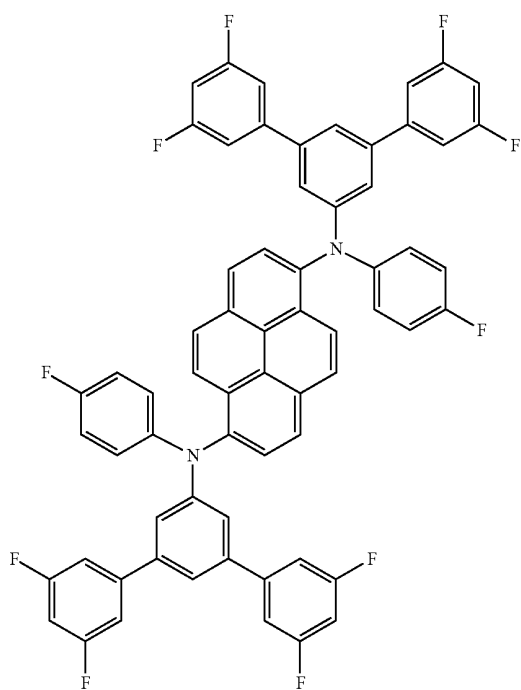


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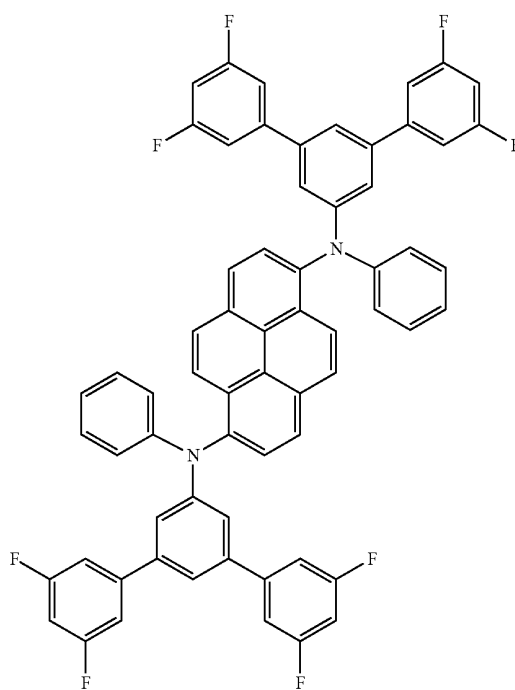
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BD 224

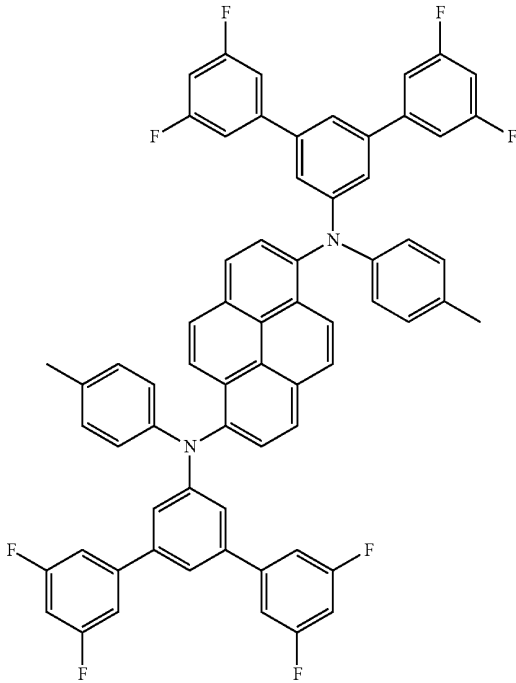


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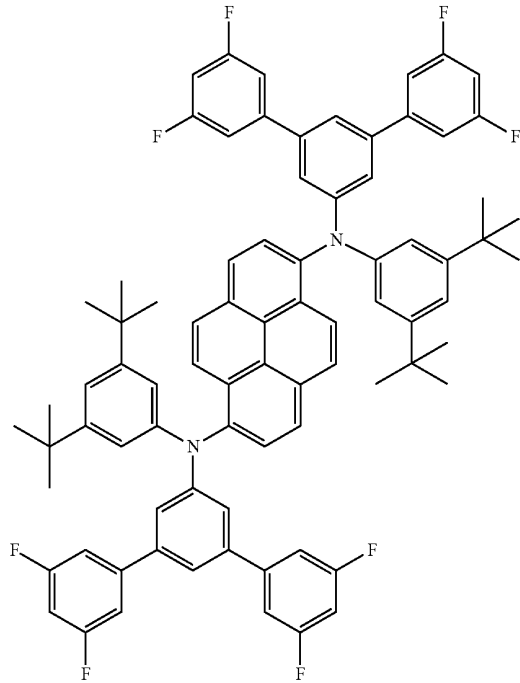
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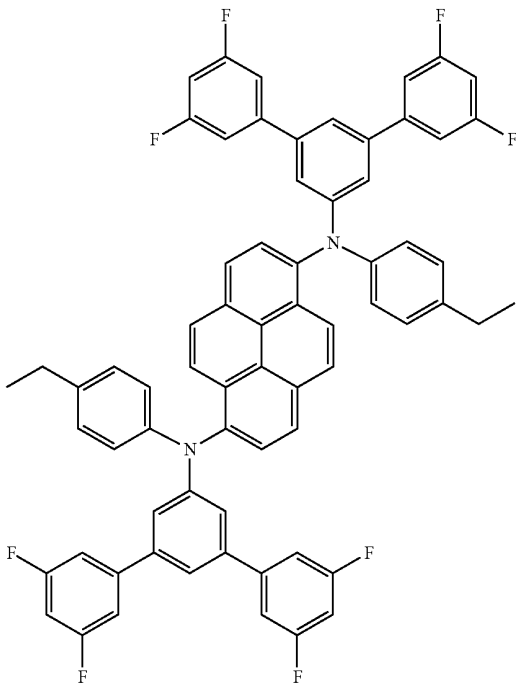


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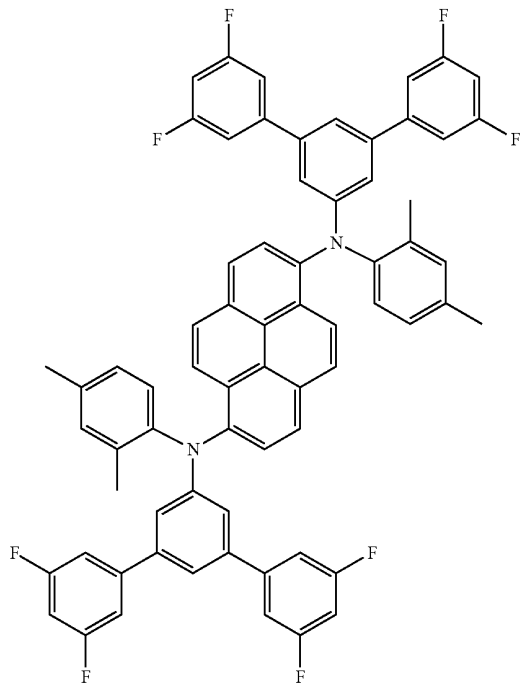
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BD 228

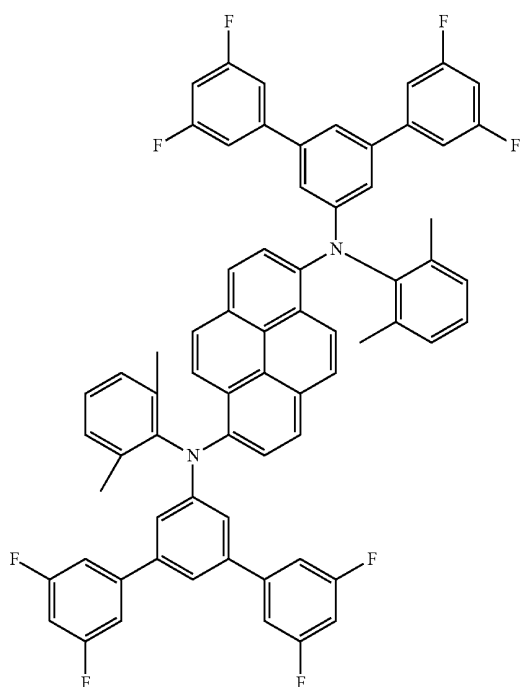


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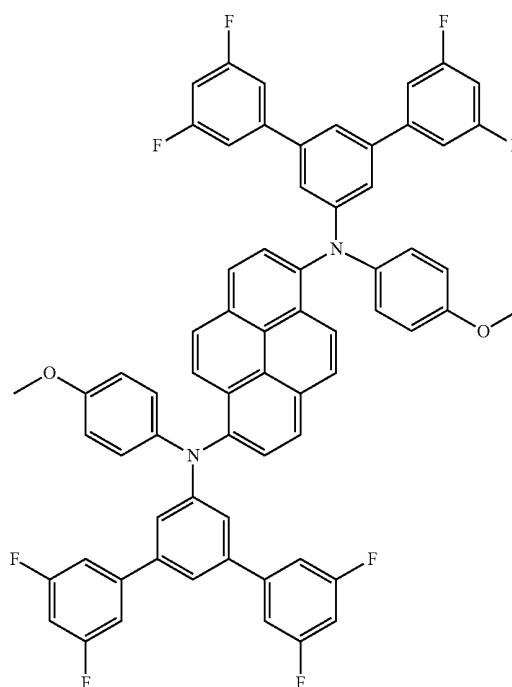
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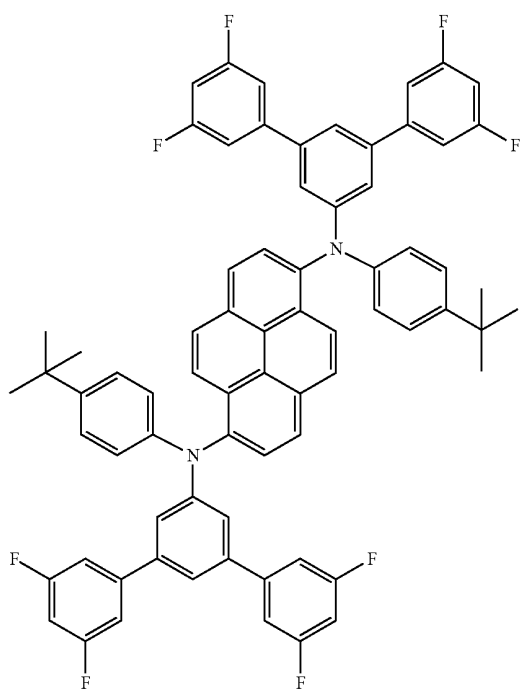


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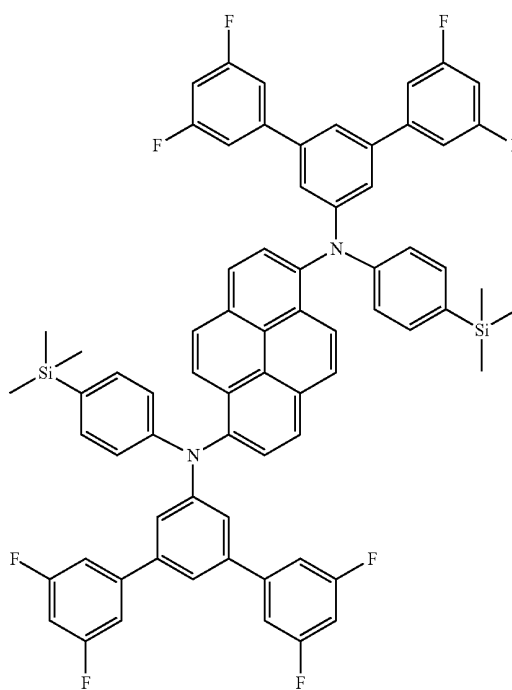
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BD 232

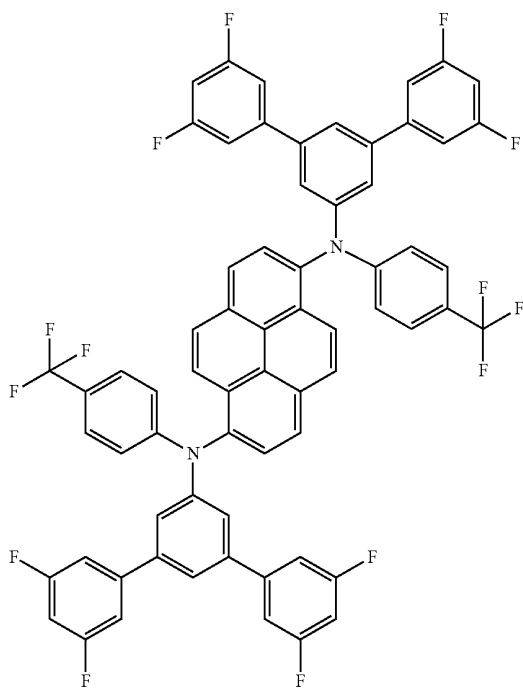


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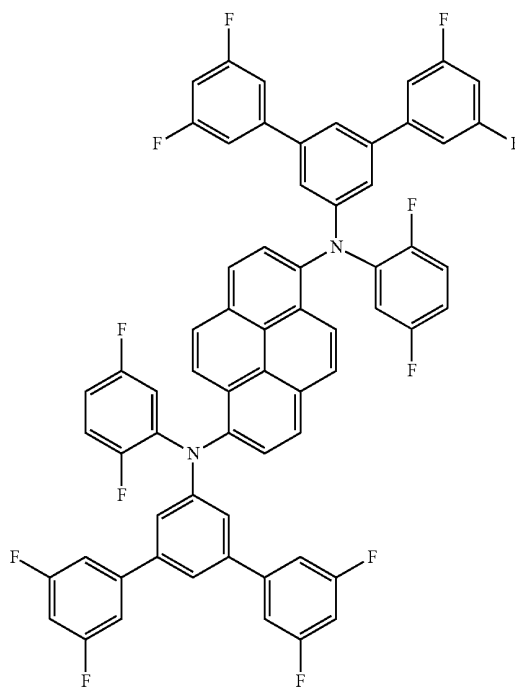
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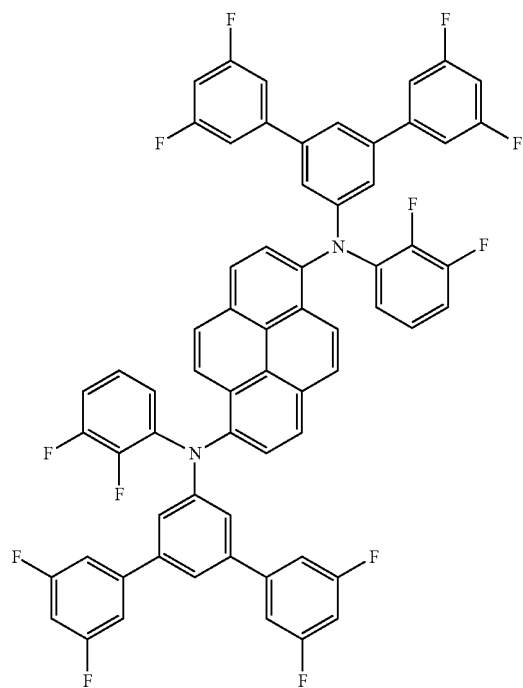


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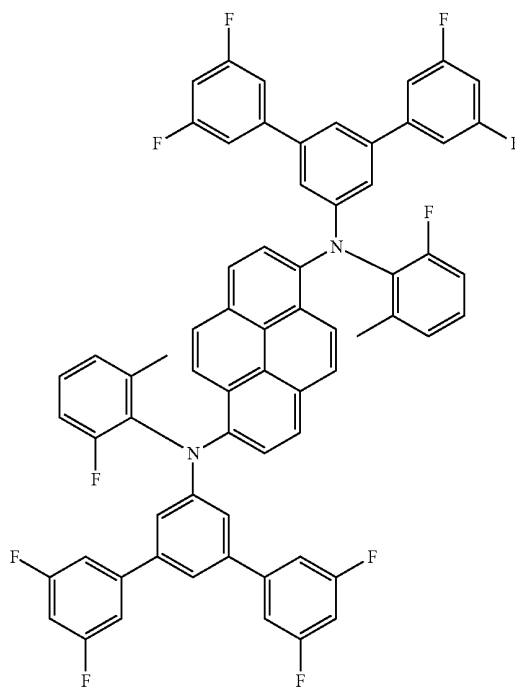
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BD 236

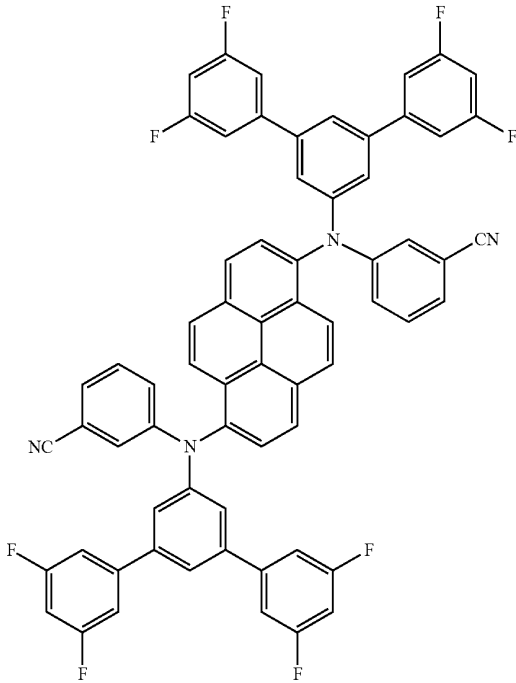


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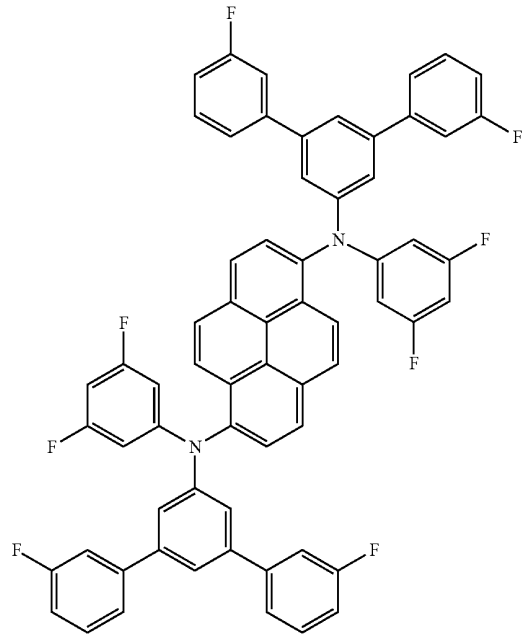
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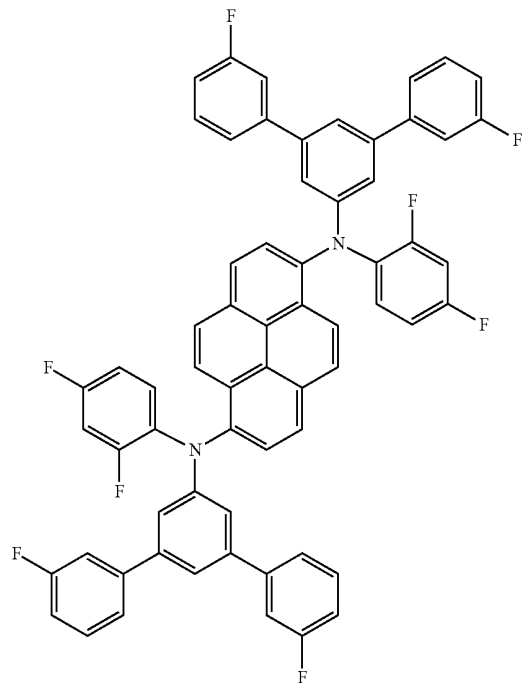
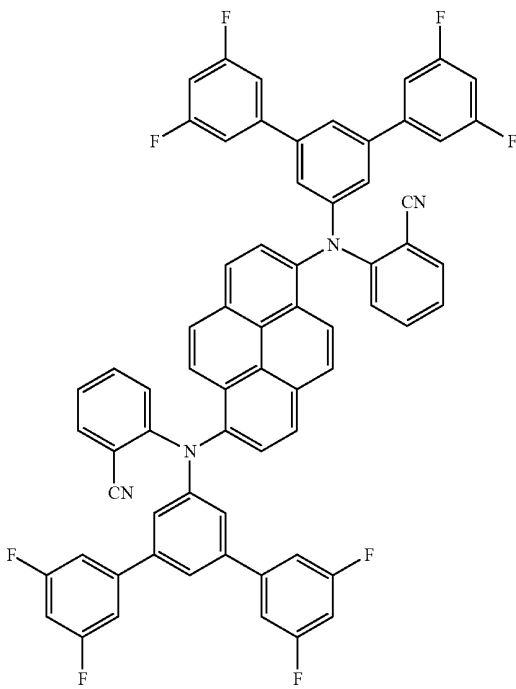
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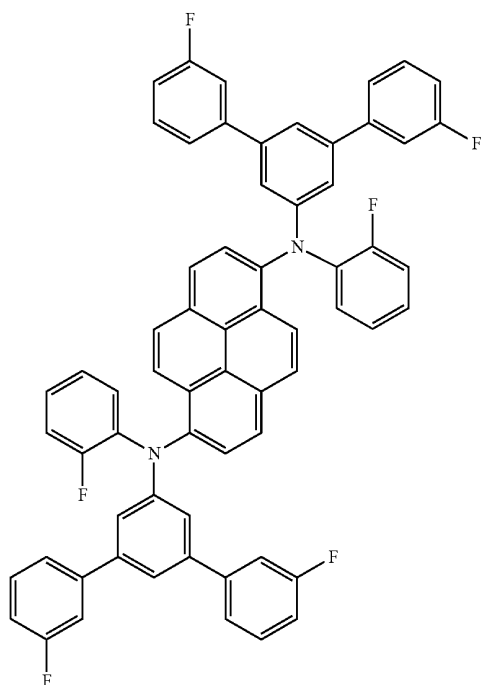
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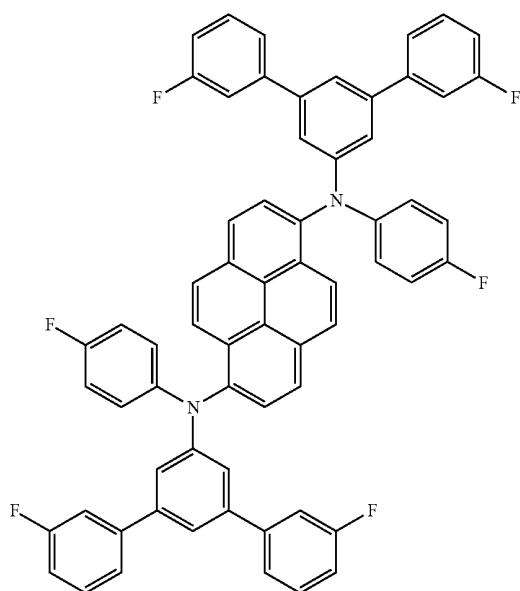
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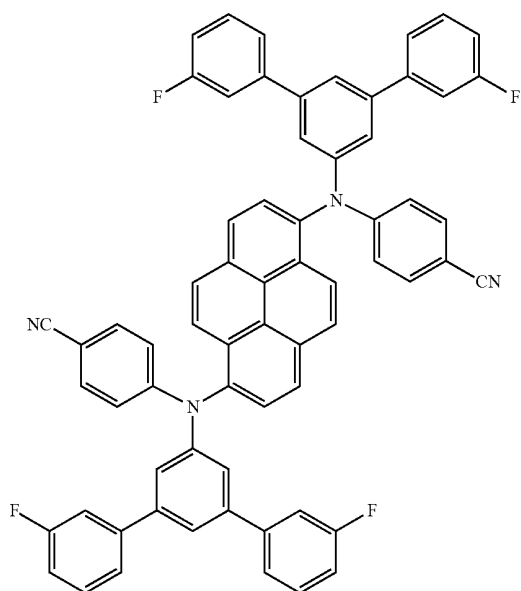


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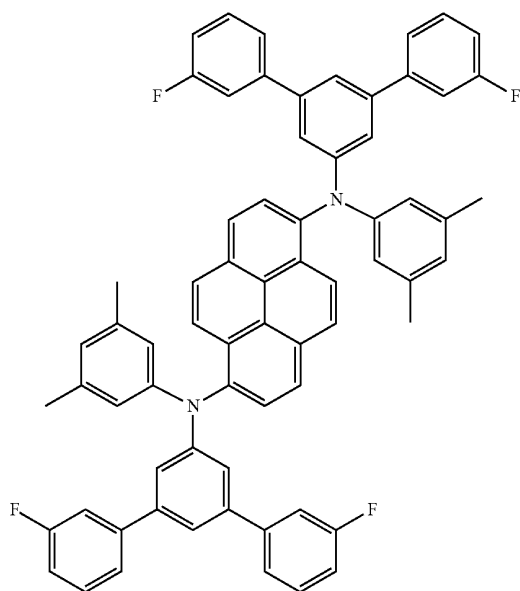
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BD 244

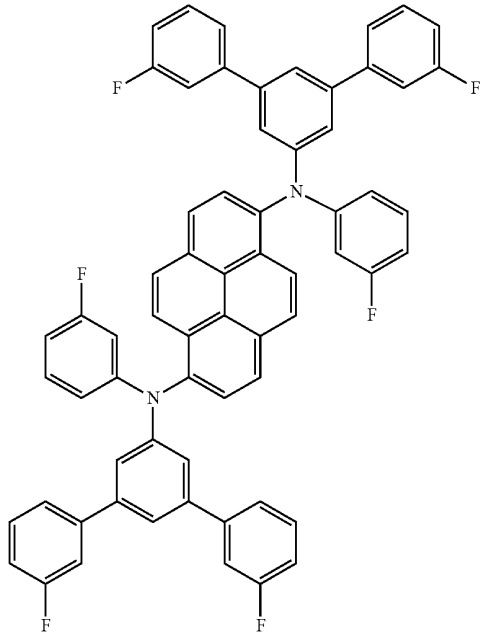


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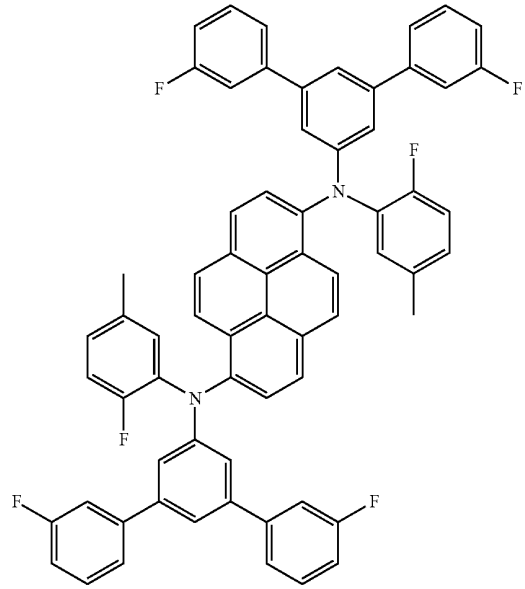
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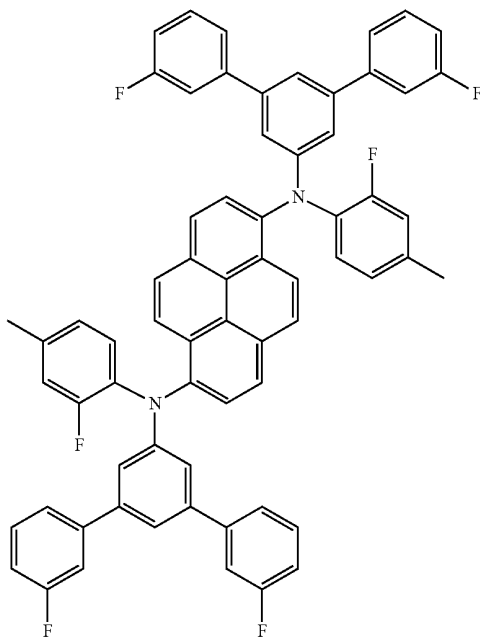


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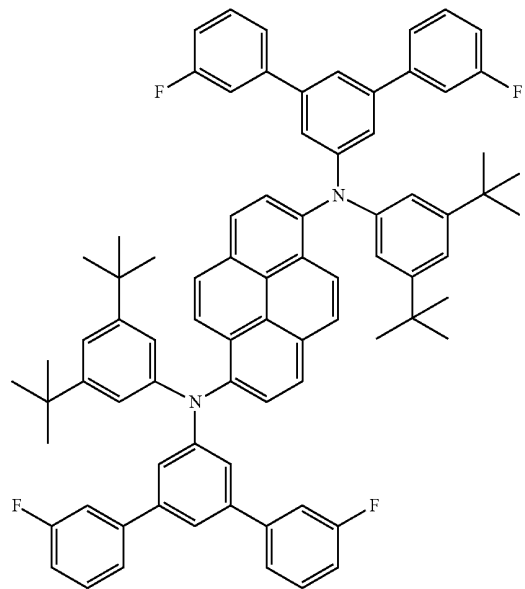
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BD 248

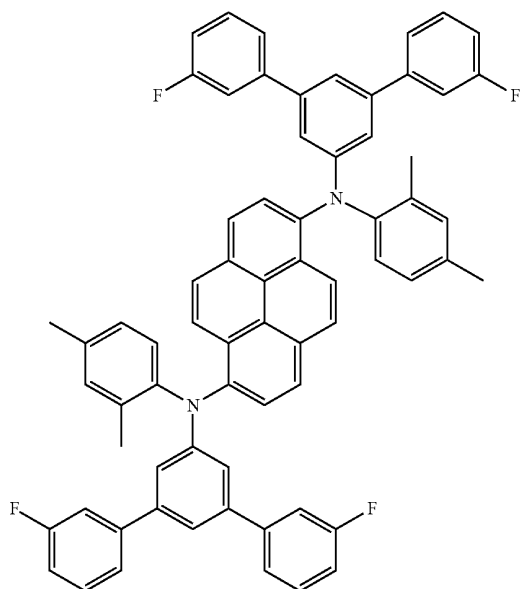


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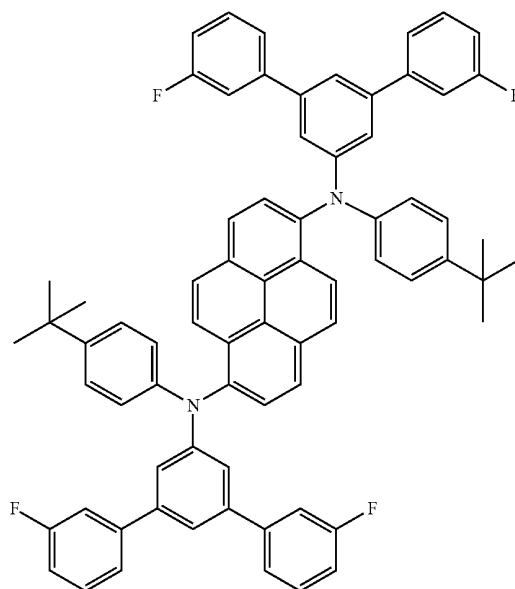
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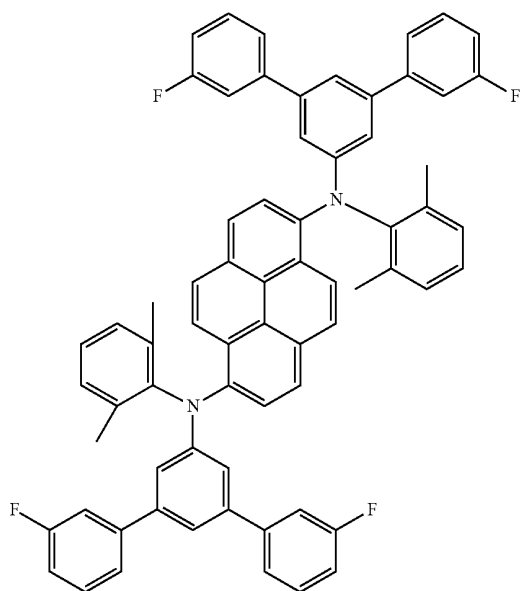


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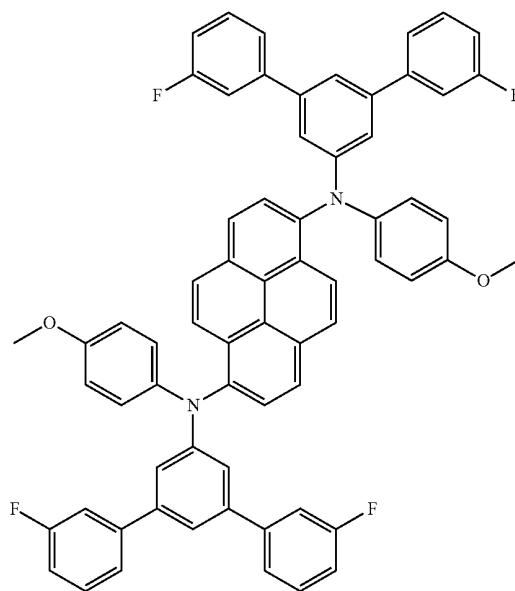
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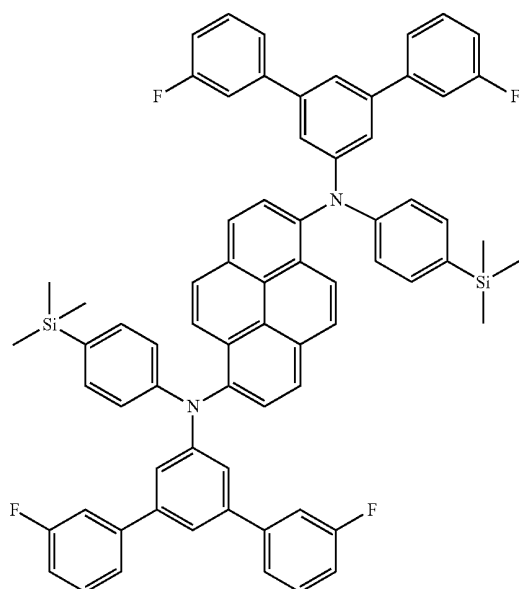


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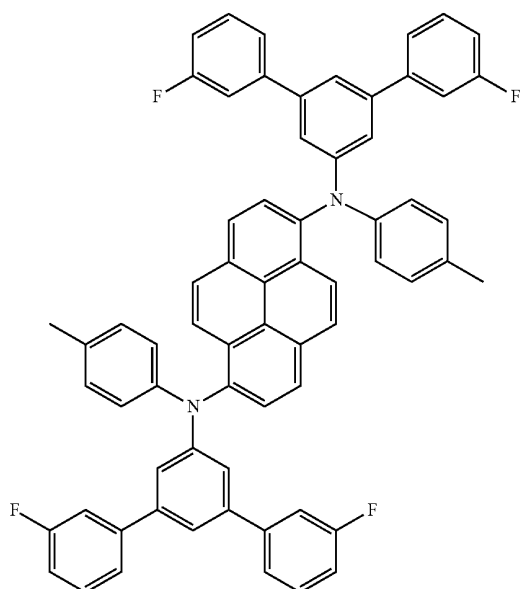
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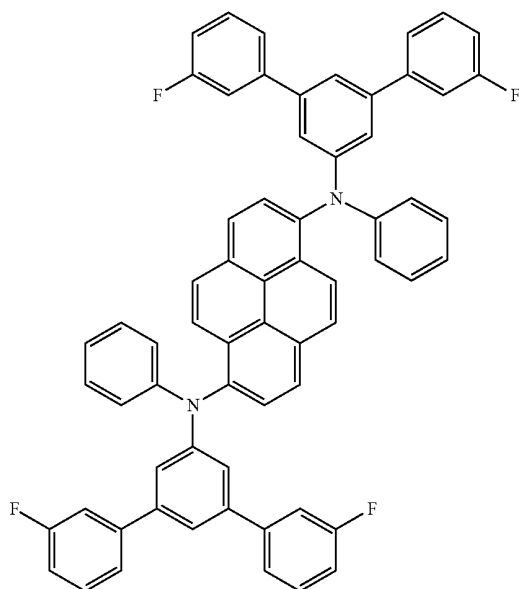


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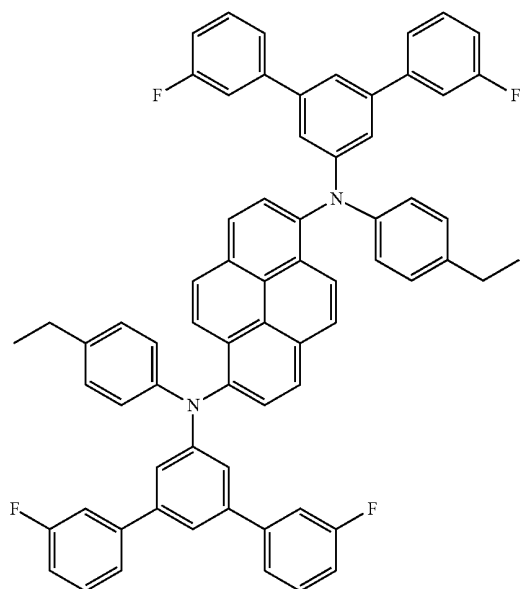
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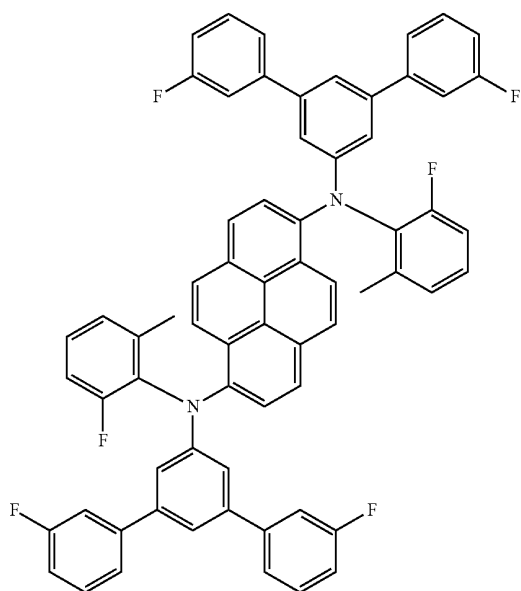


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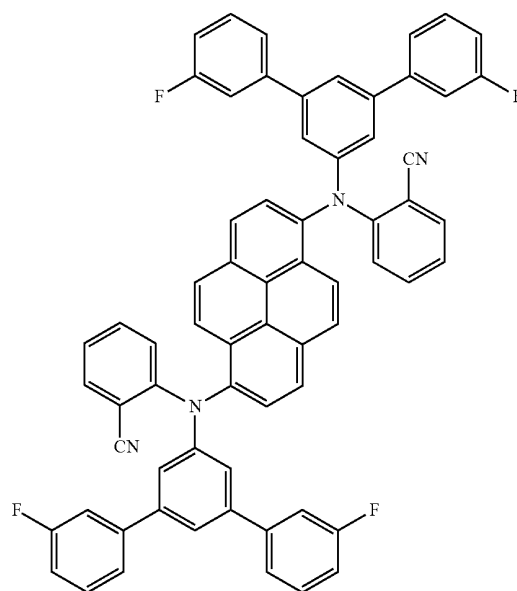
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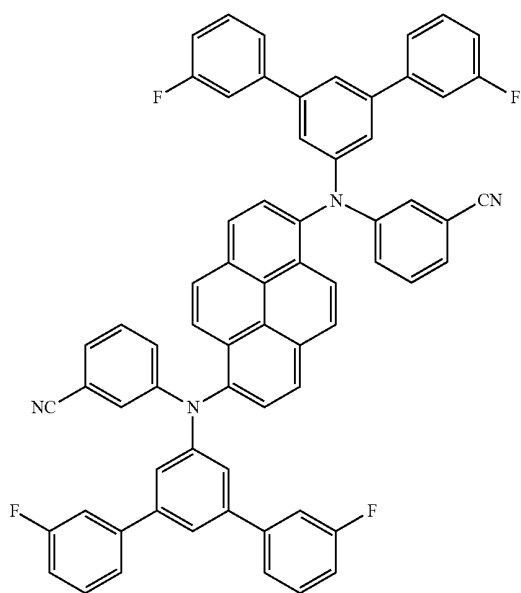


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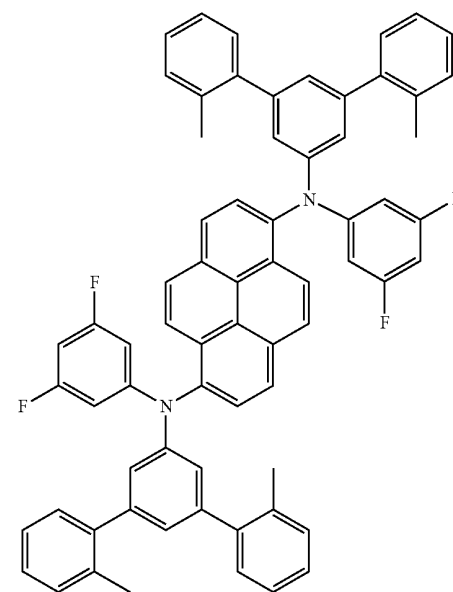
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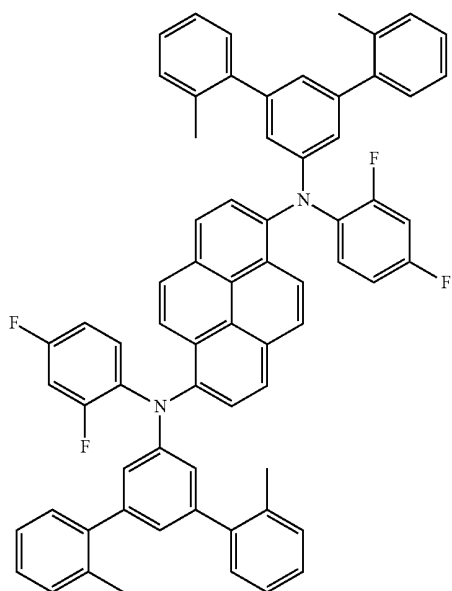
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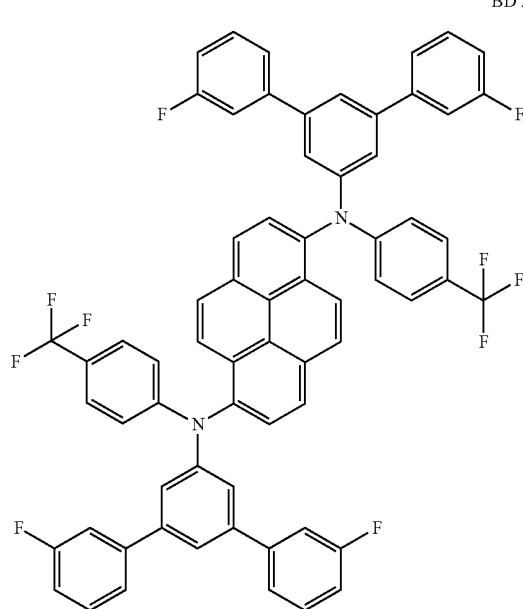


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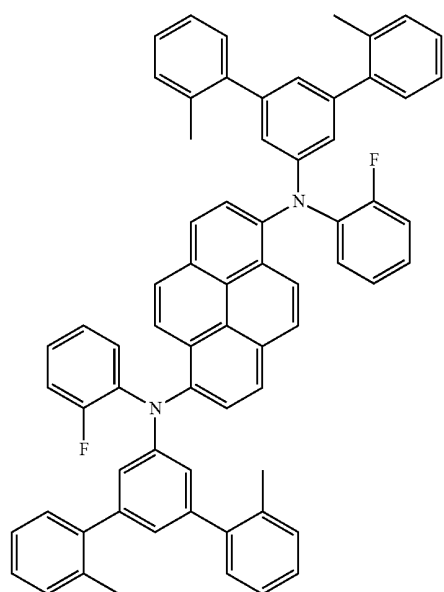


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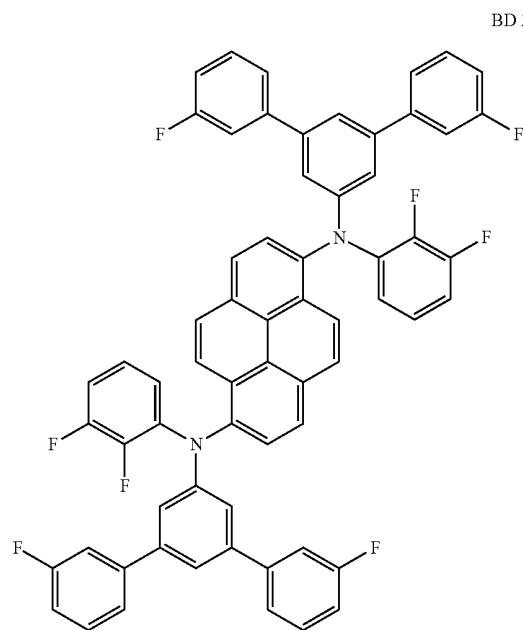
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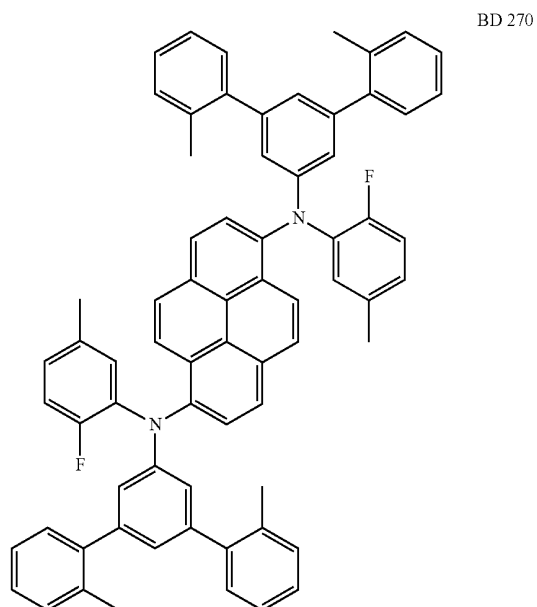


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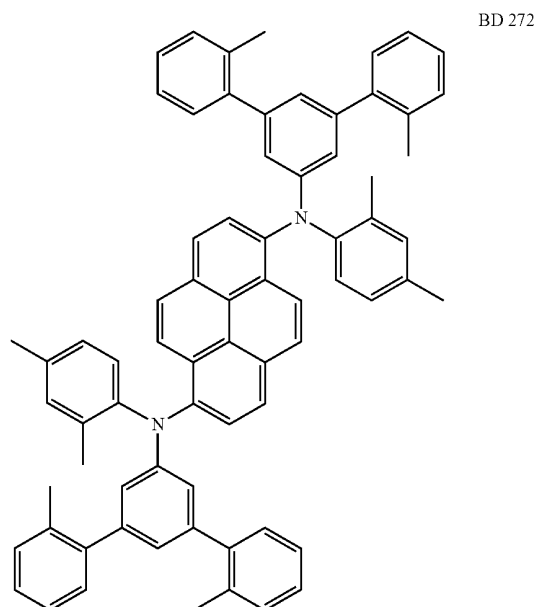


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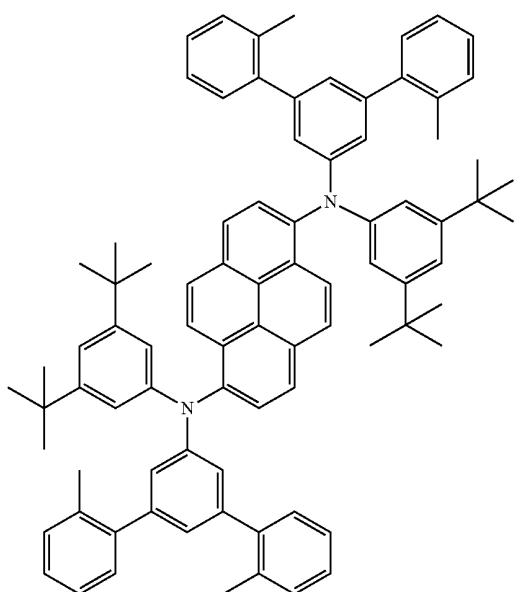
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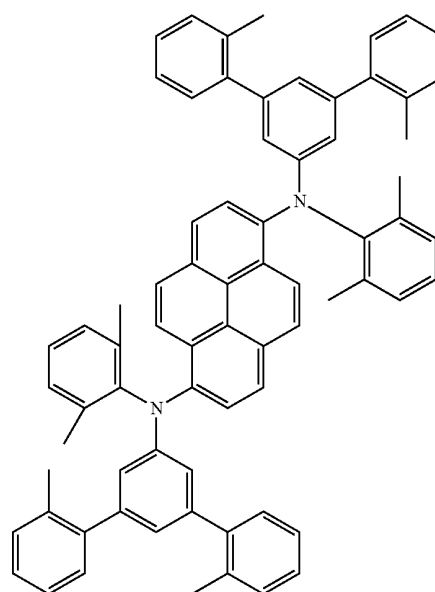
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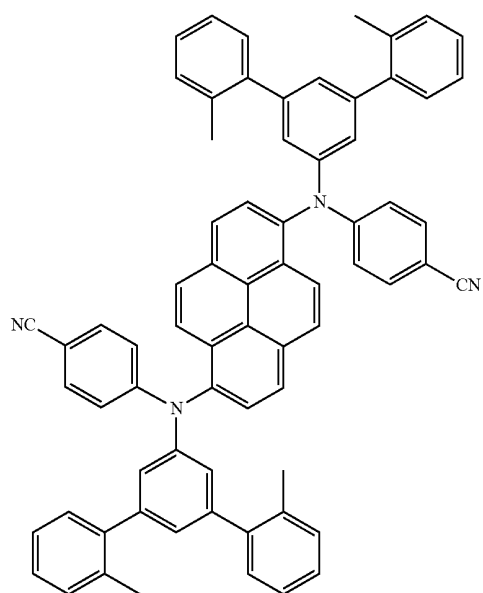


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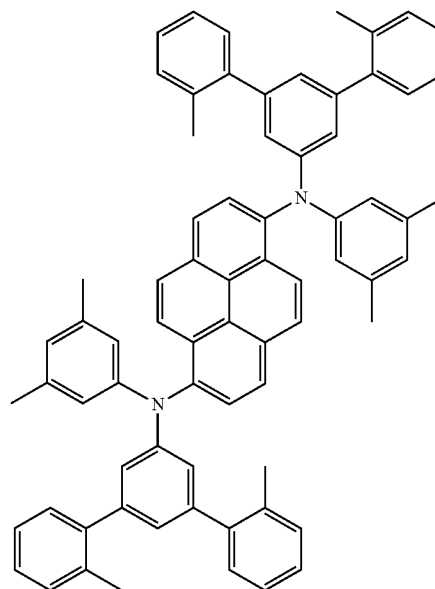
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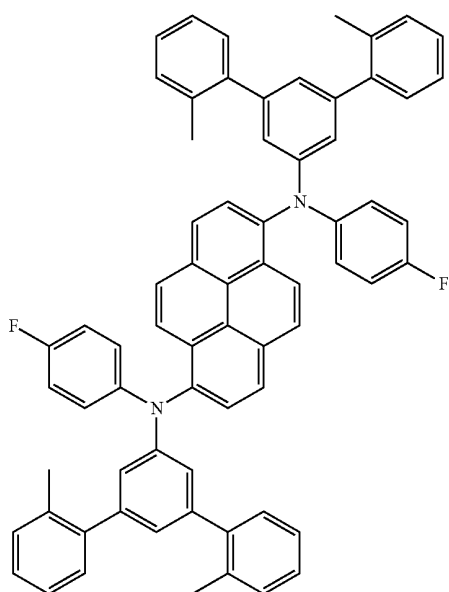


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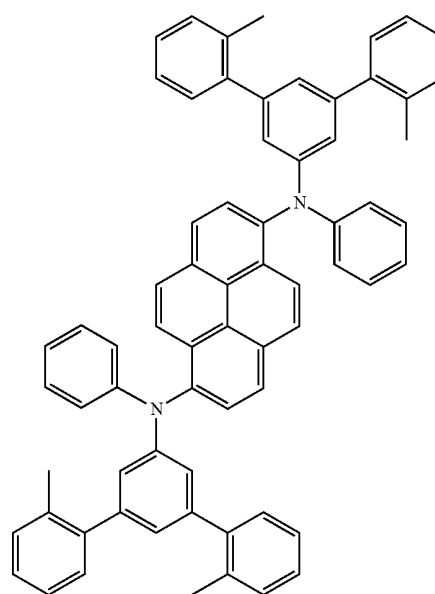
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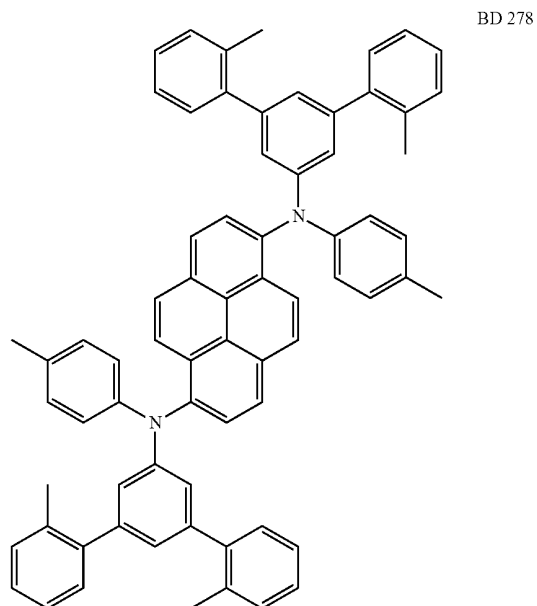
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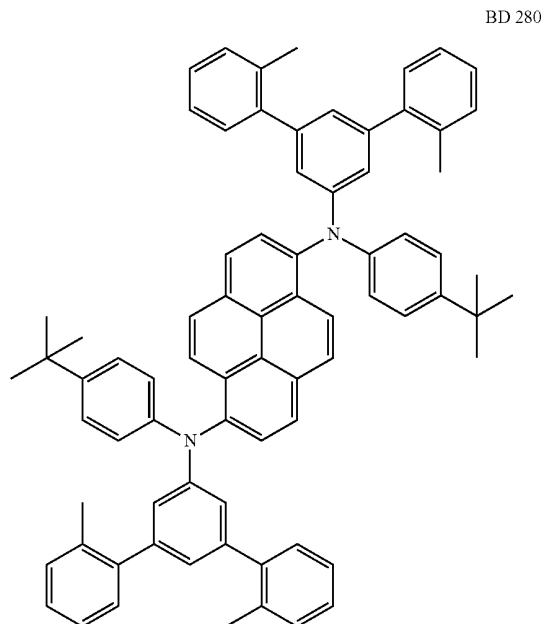
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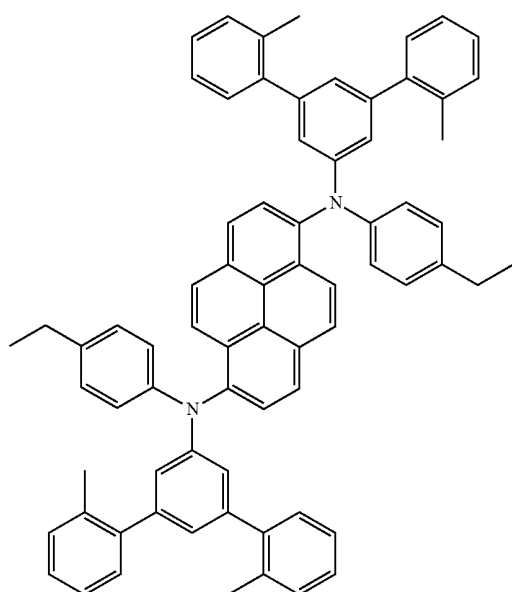
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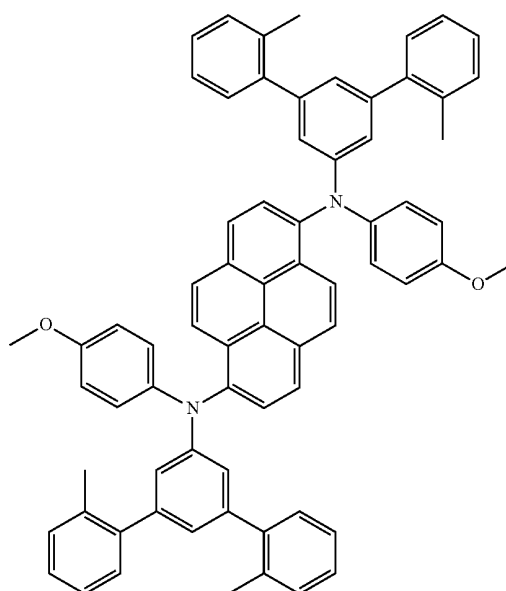
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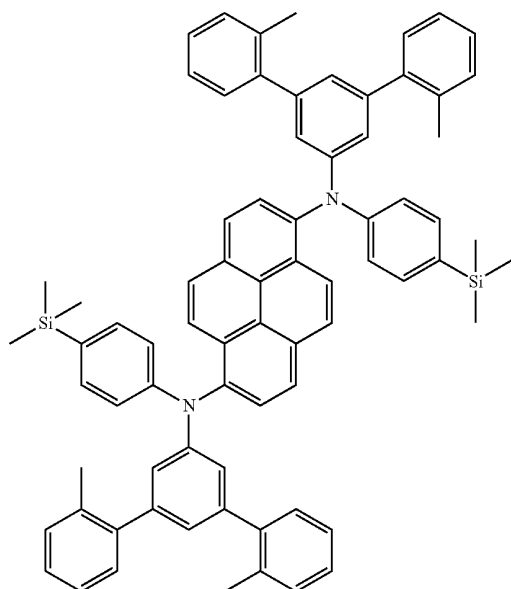


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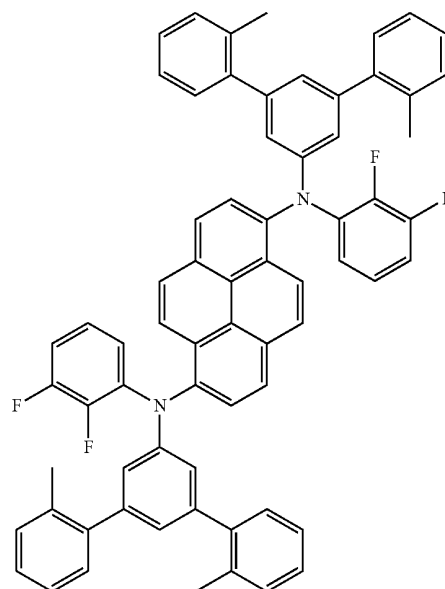
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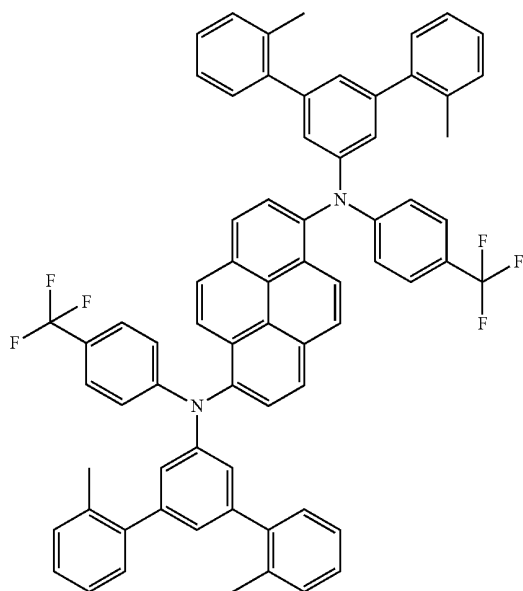


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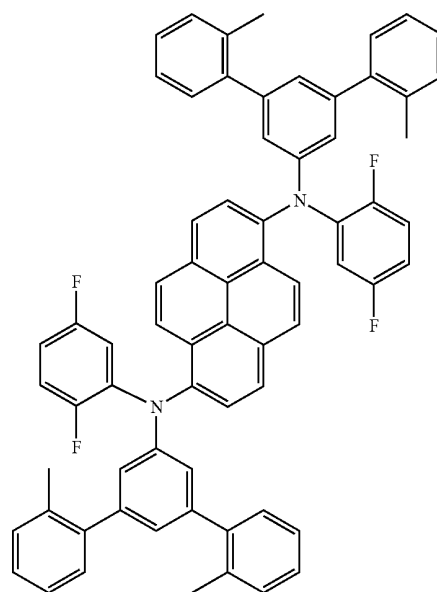
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BD 283

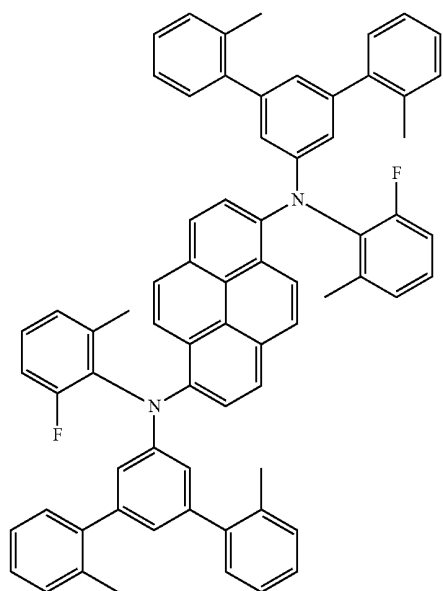


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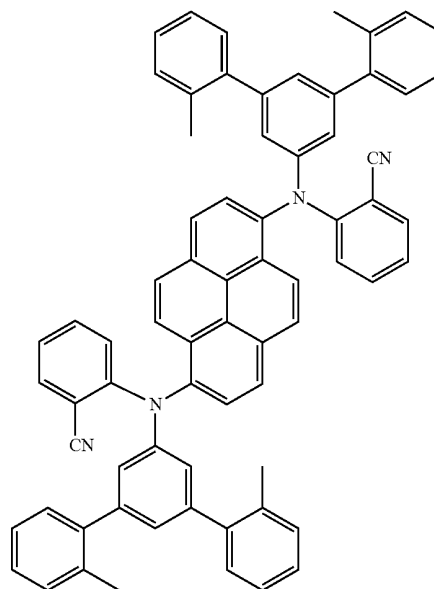
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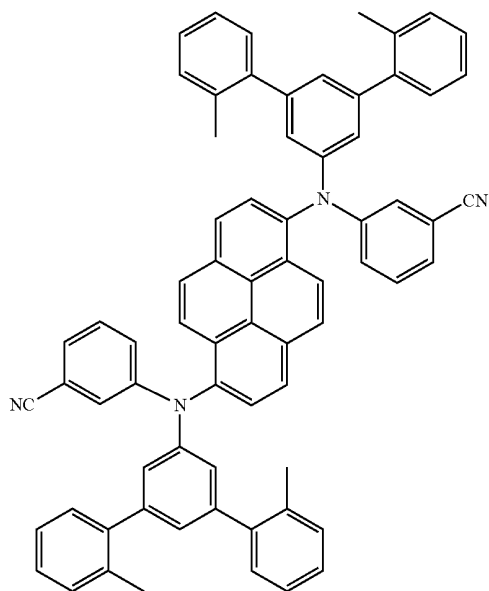


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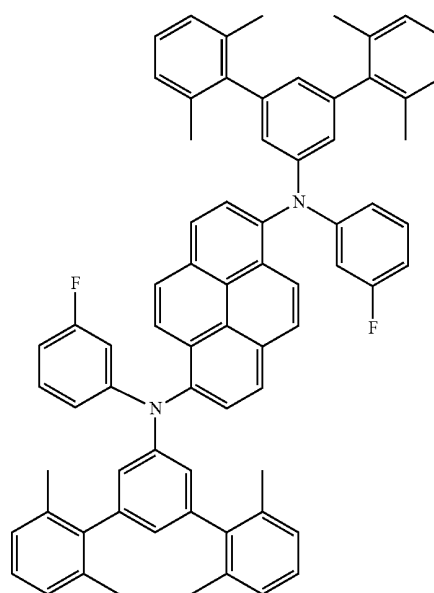
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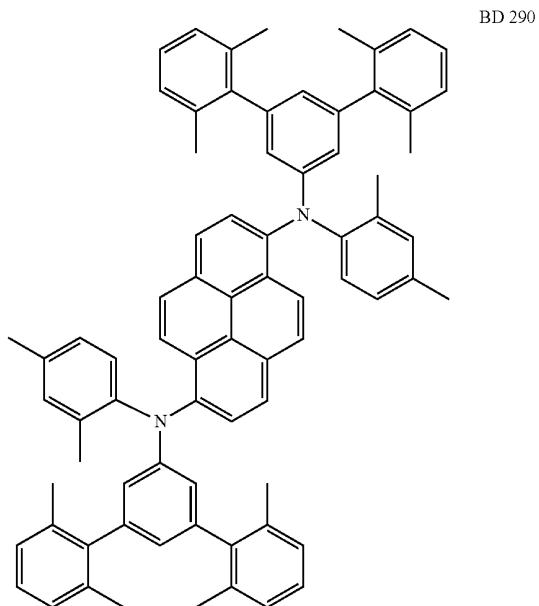
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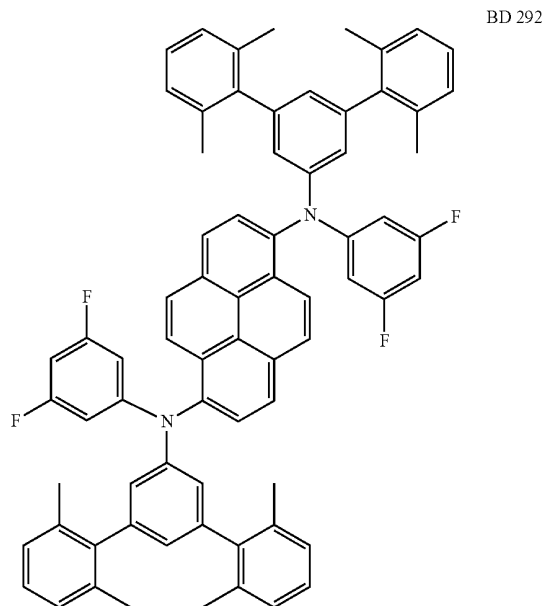
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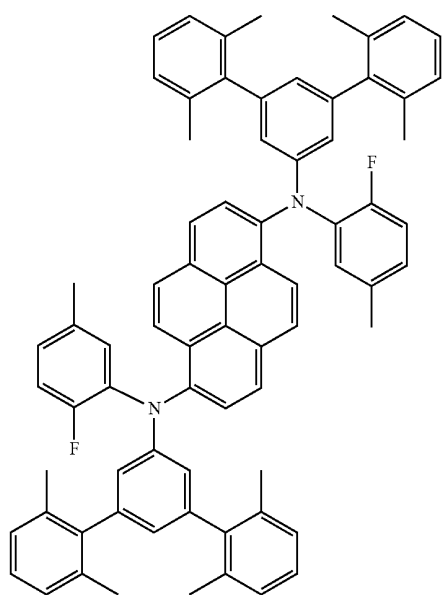
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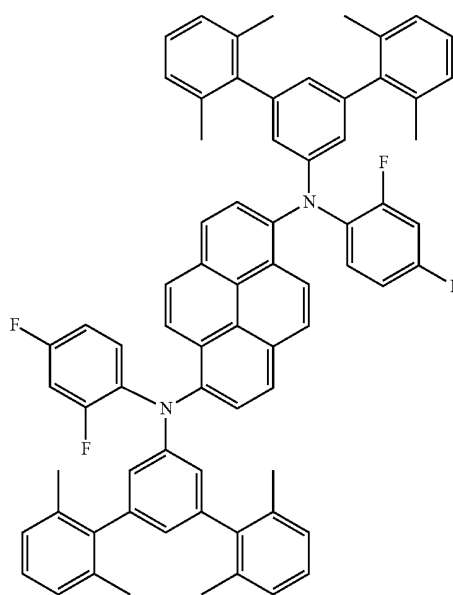
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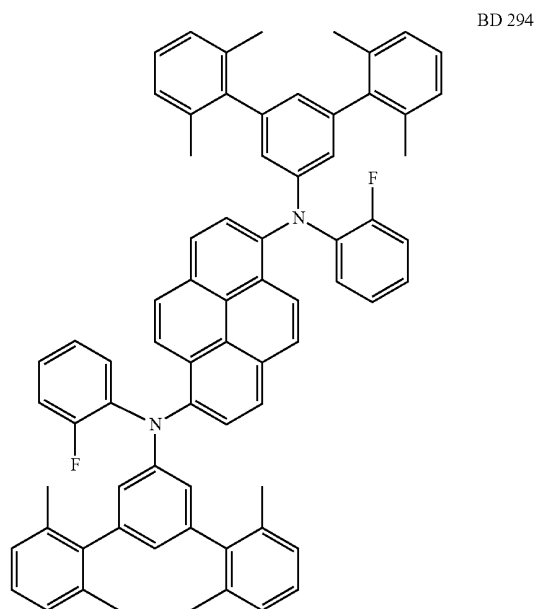
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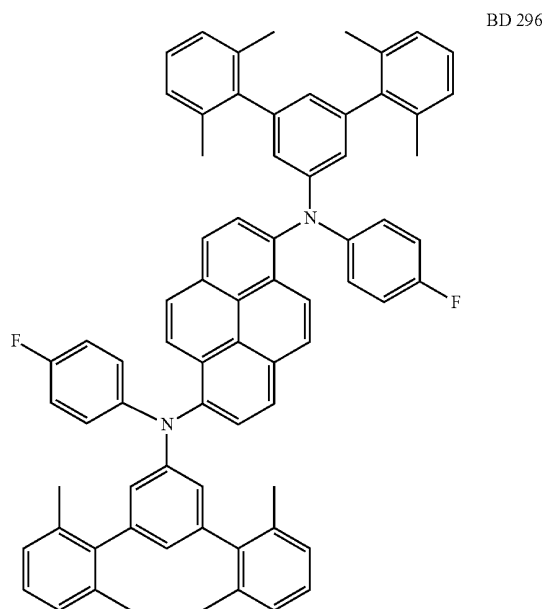
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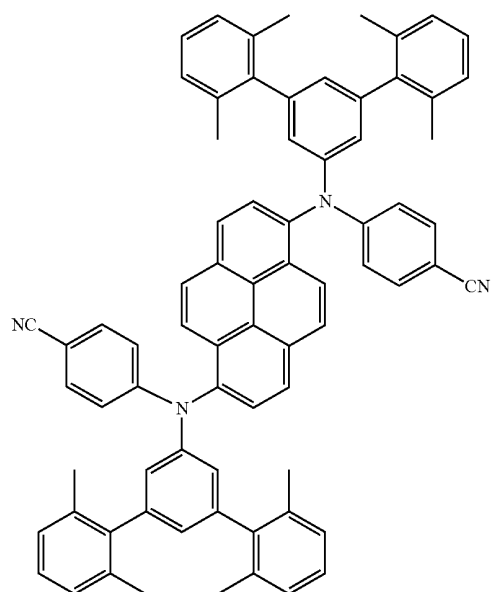
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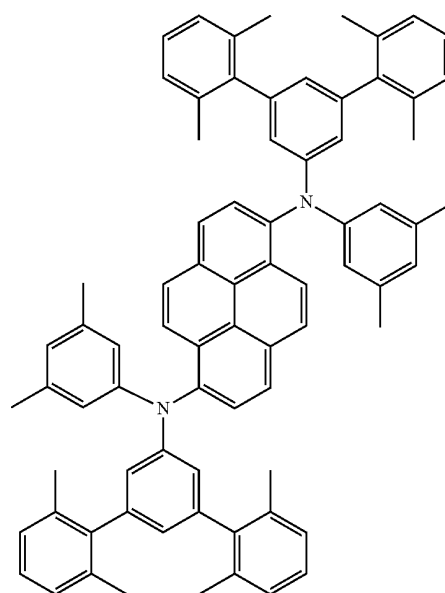
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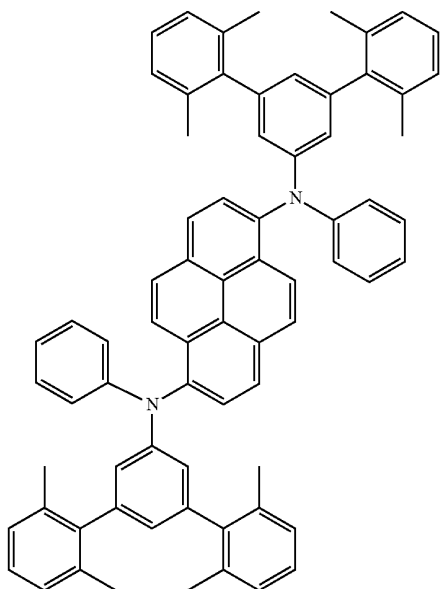


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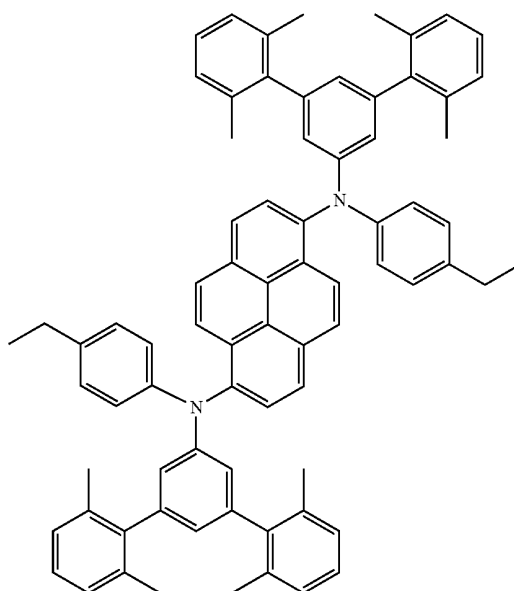
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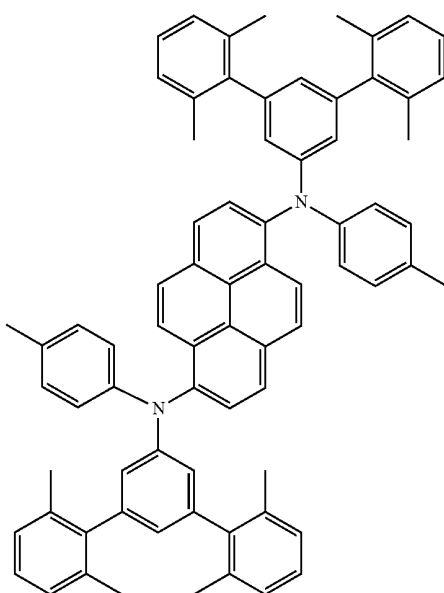


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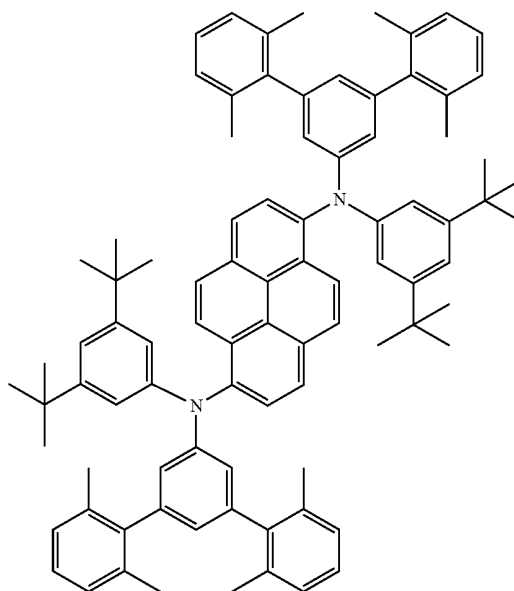
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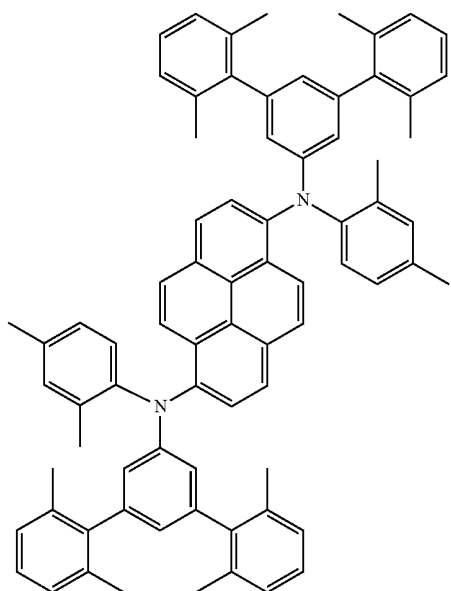
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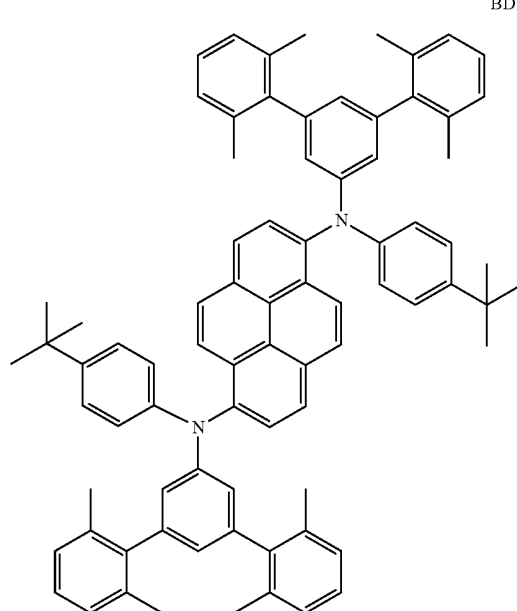


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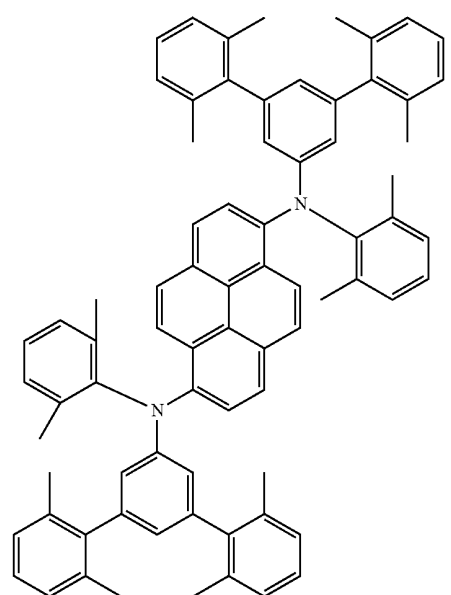
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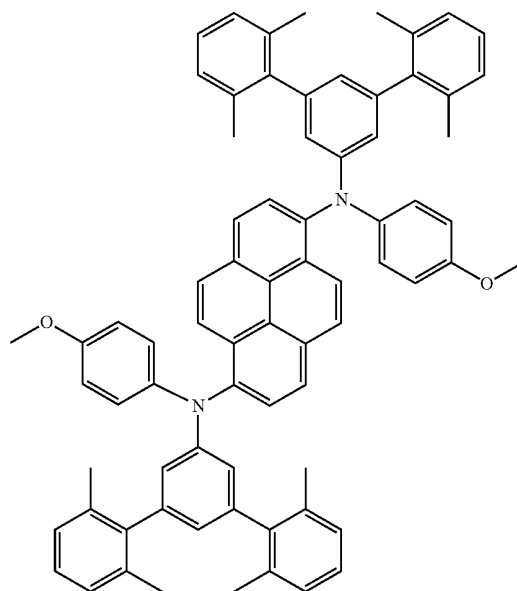


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BD 303

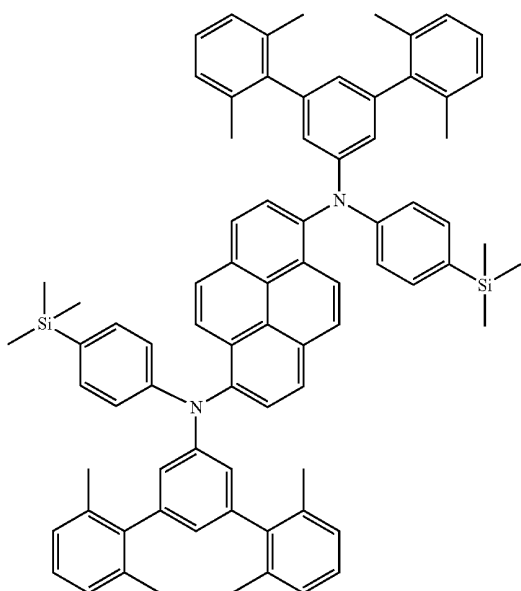


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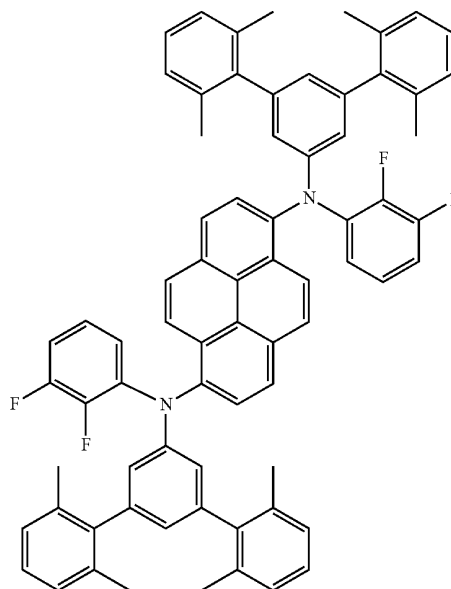
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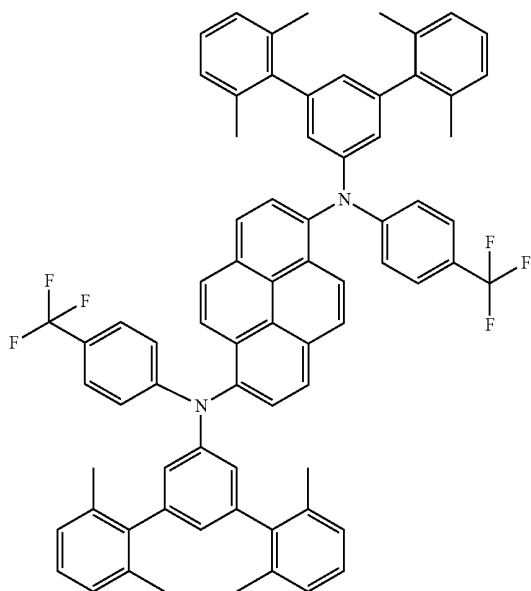


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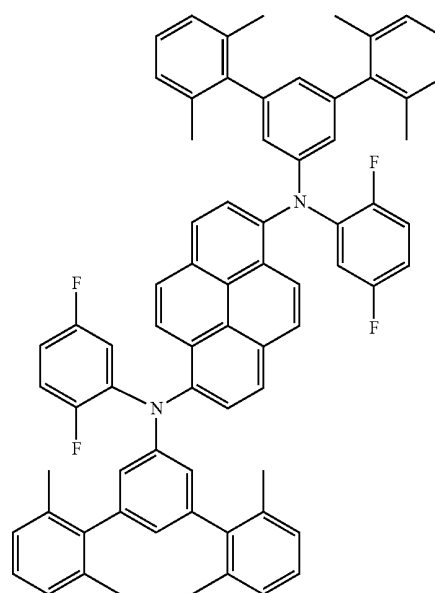
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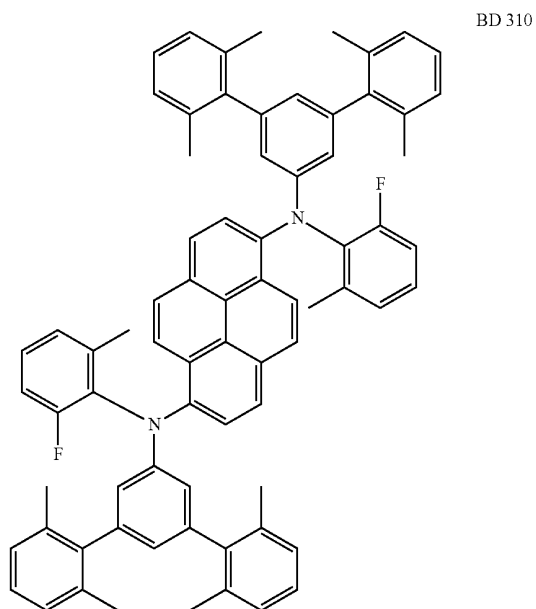
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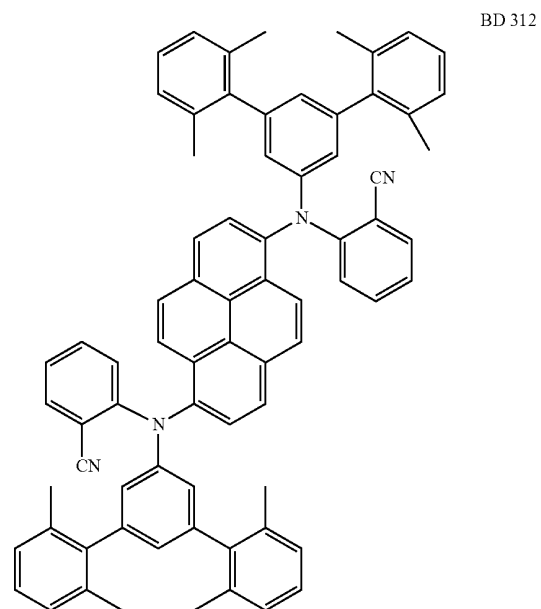
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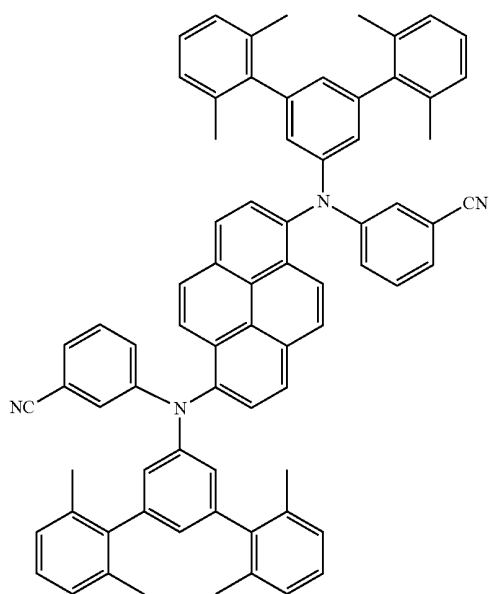
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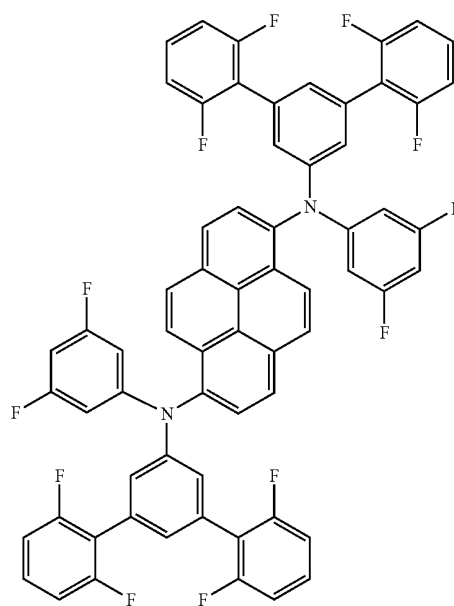
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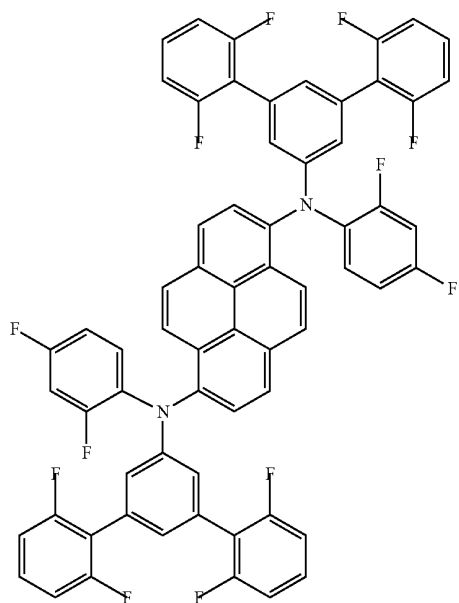
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BD 313

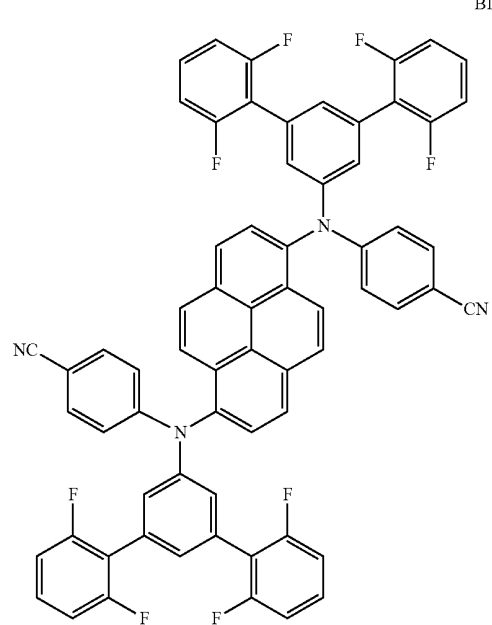


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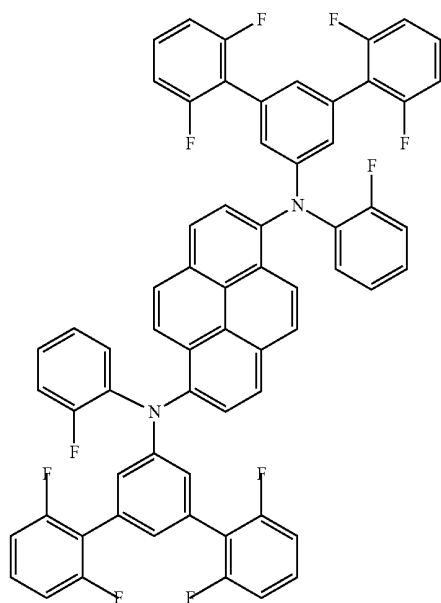
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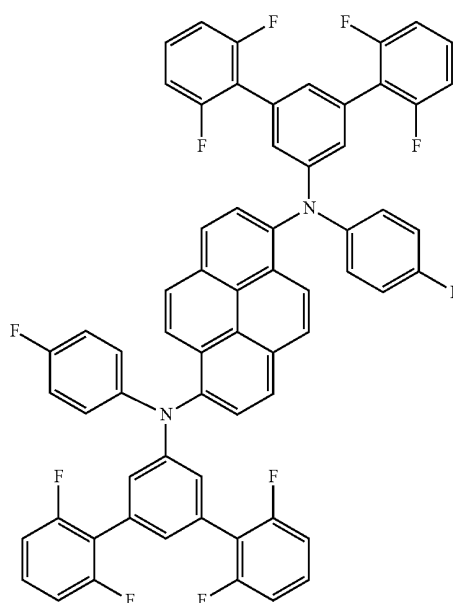


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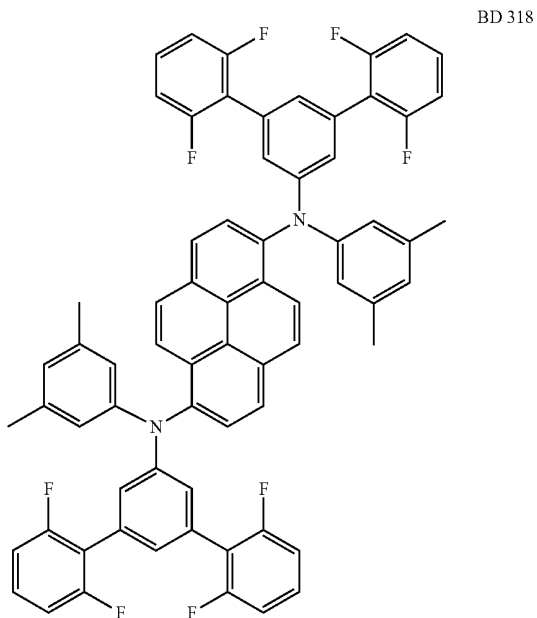
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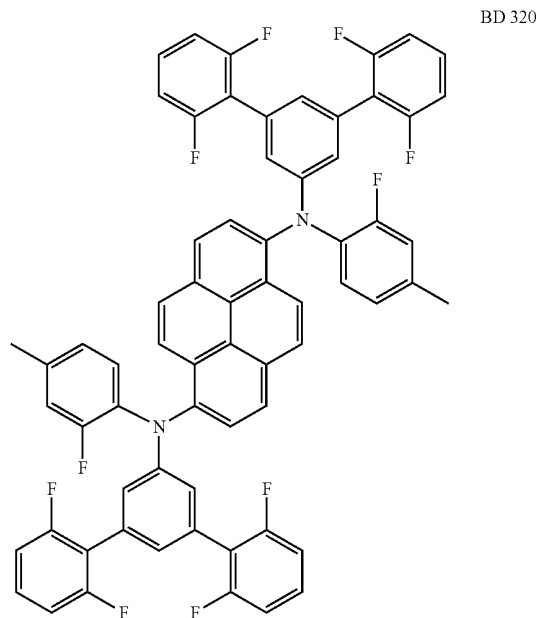
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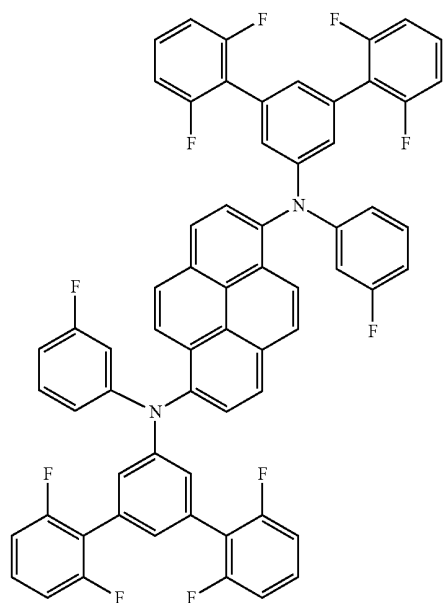
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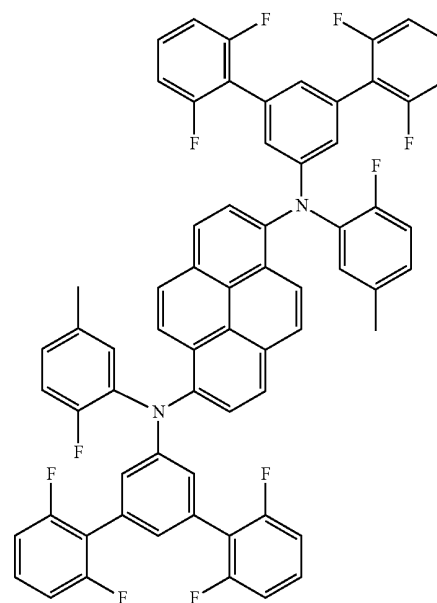
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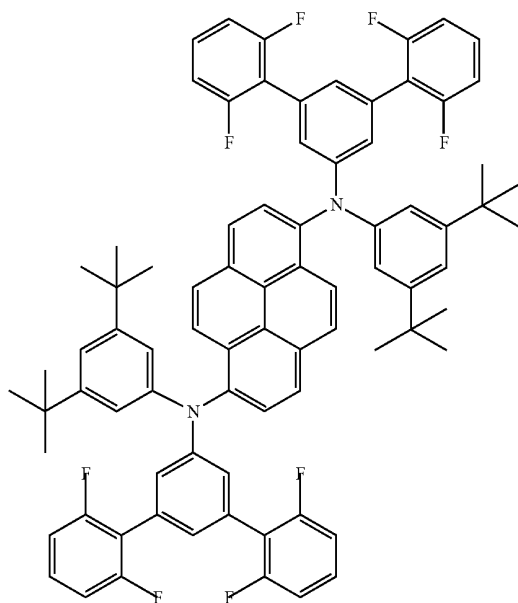


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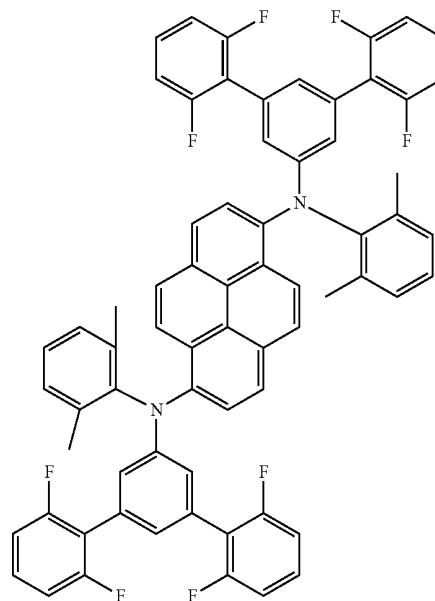
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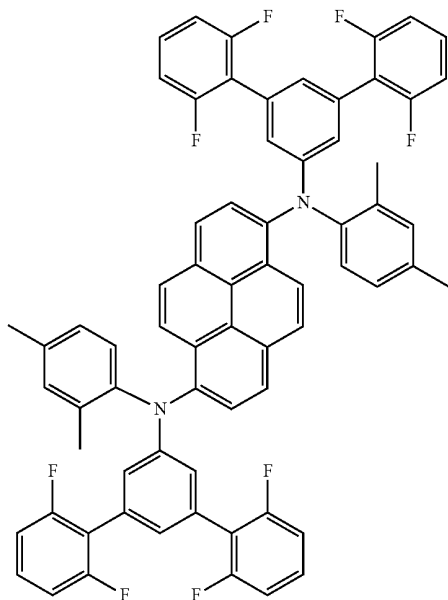


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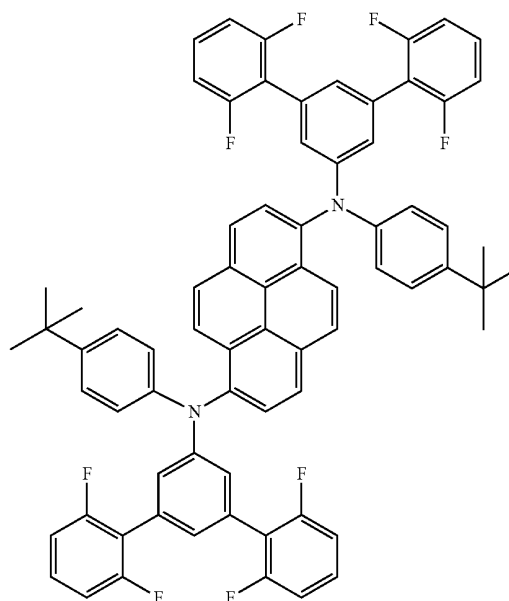
BD 324



BD 323

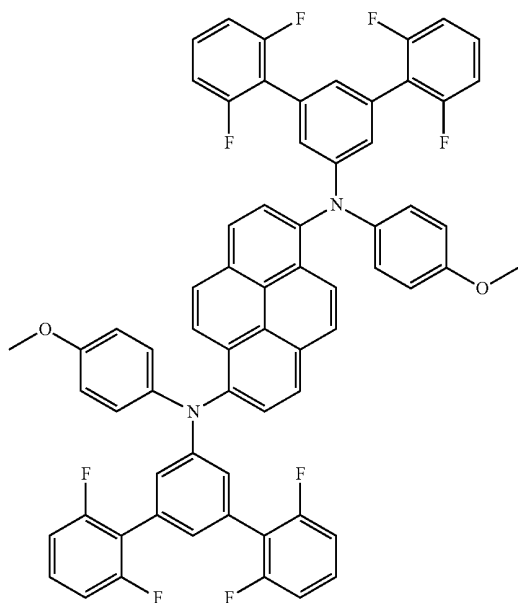


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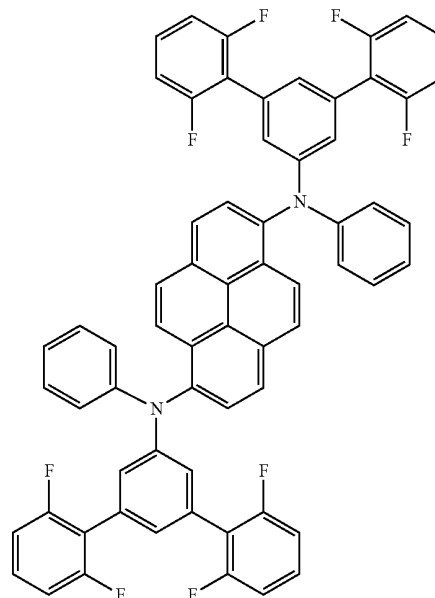
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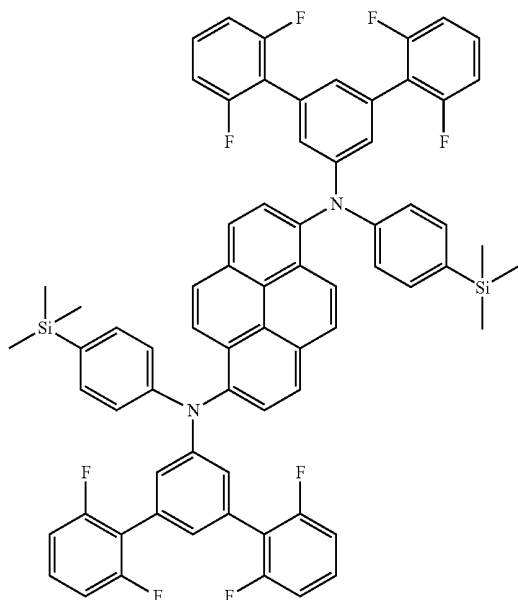


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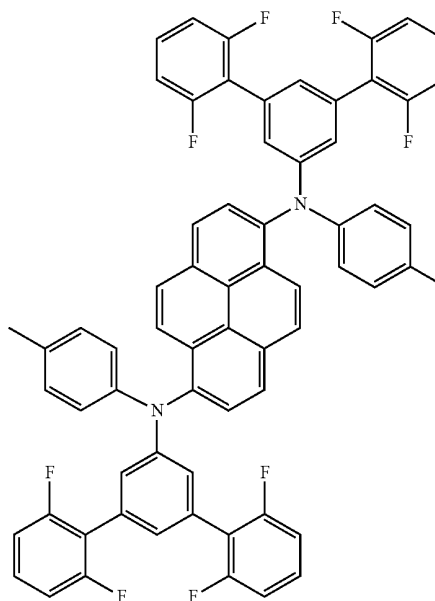
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BD 327

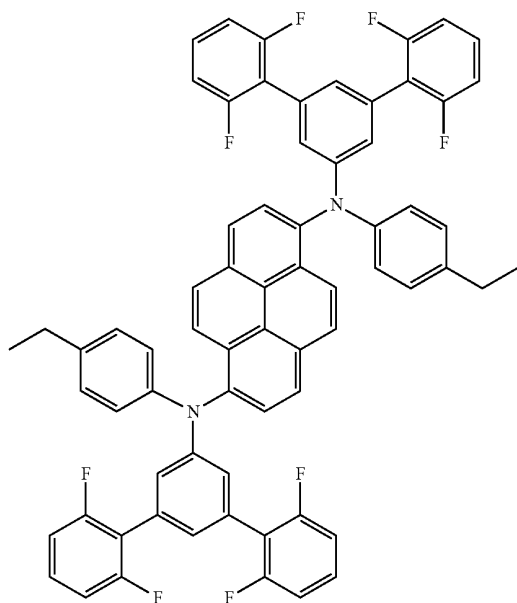


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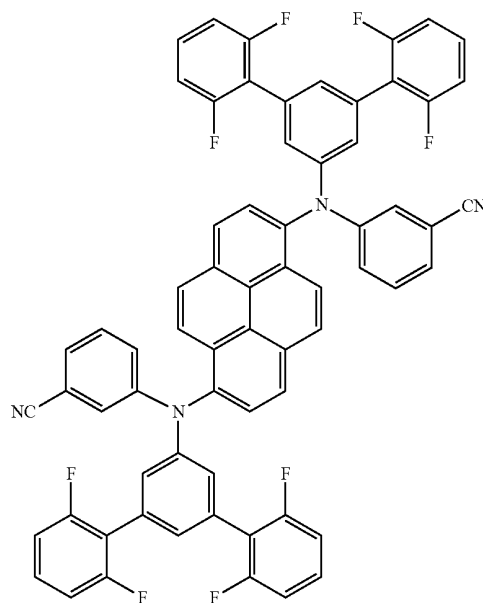
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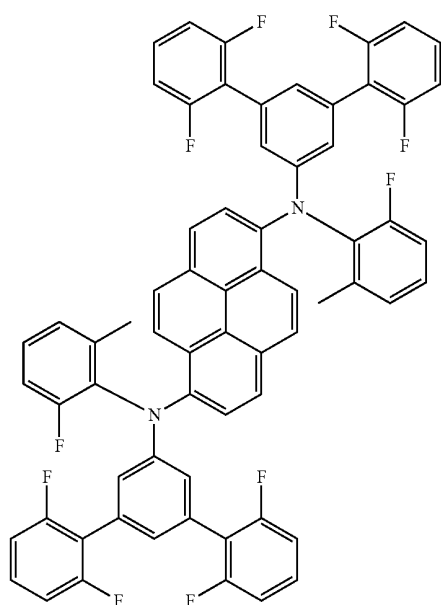


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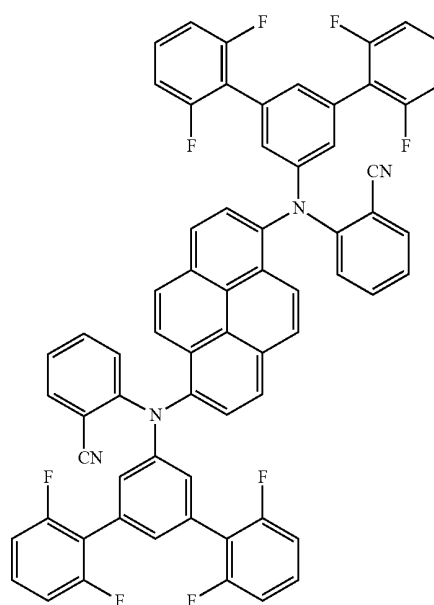
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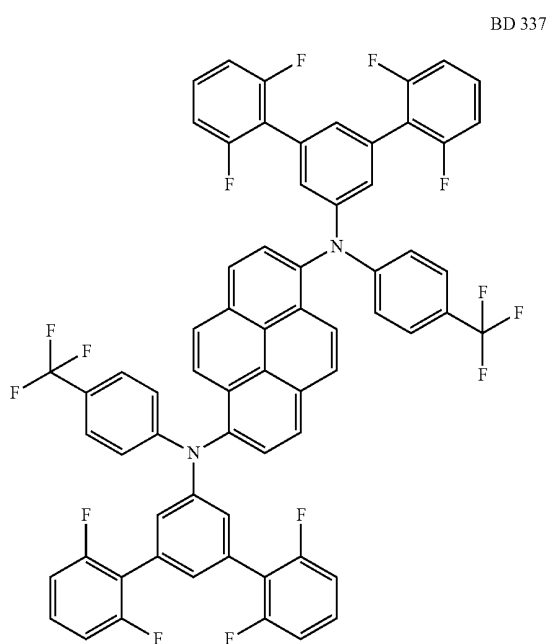
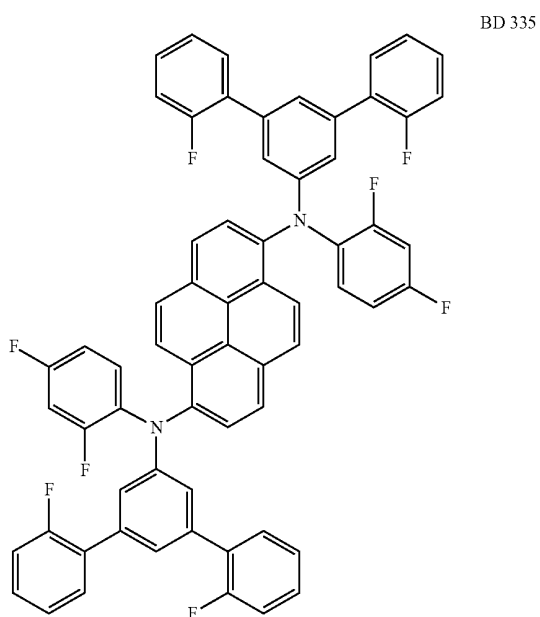
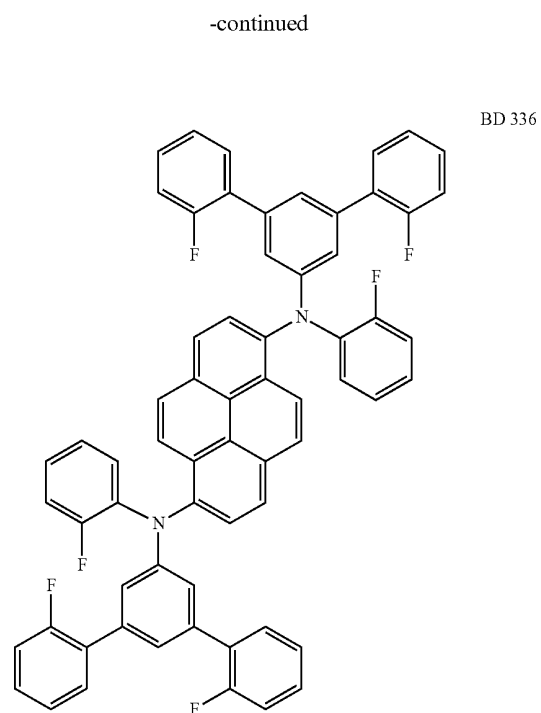
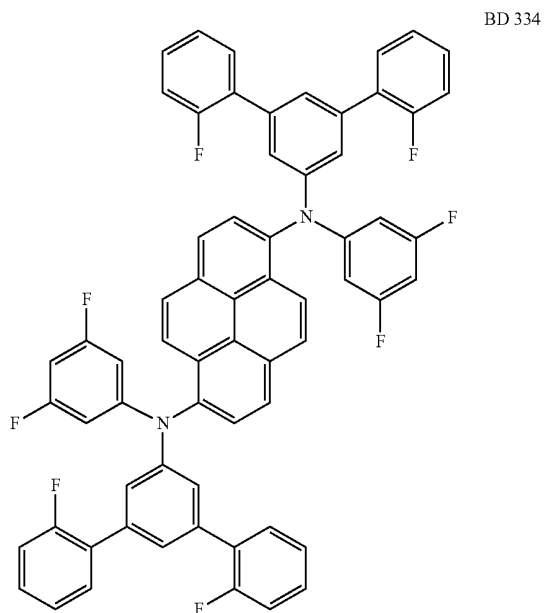
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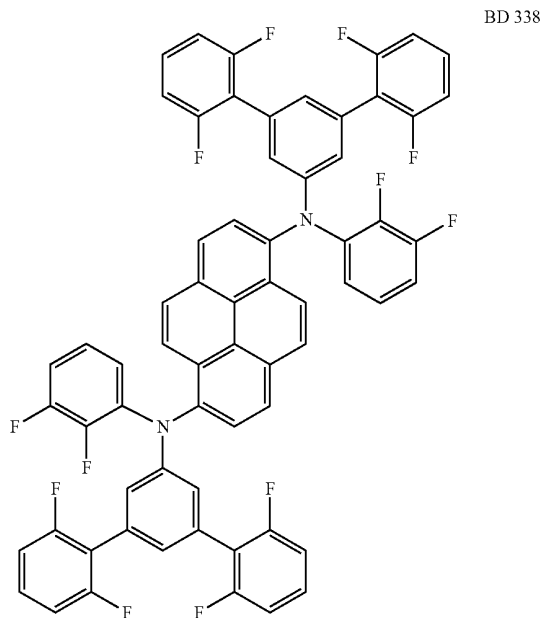
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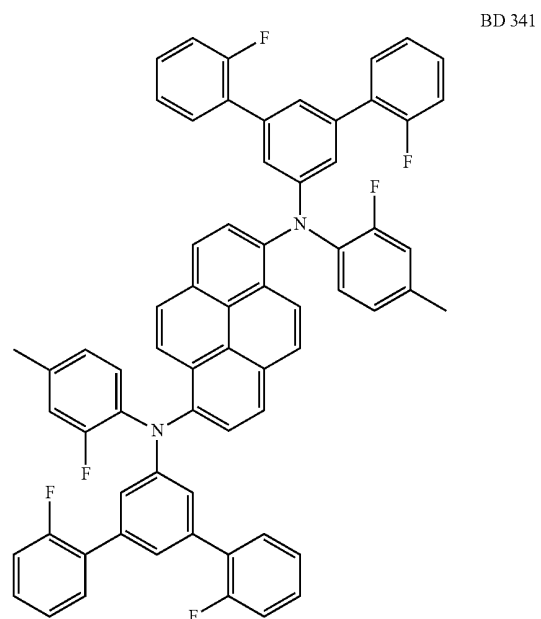
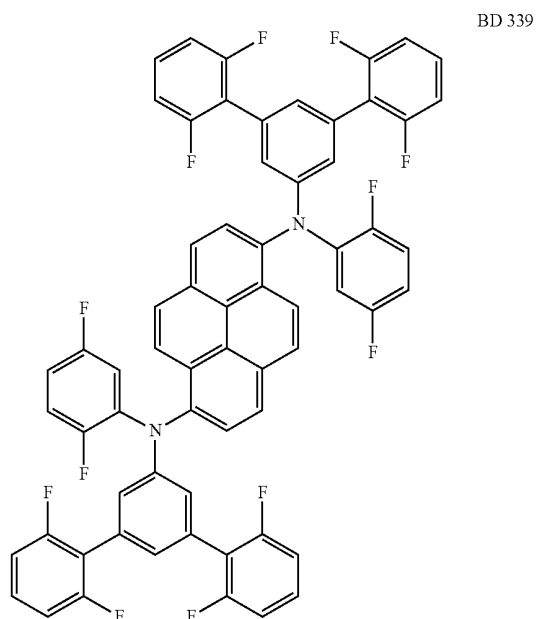
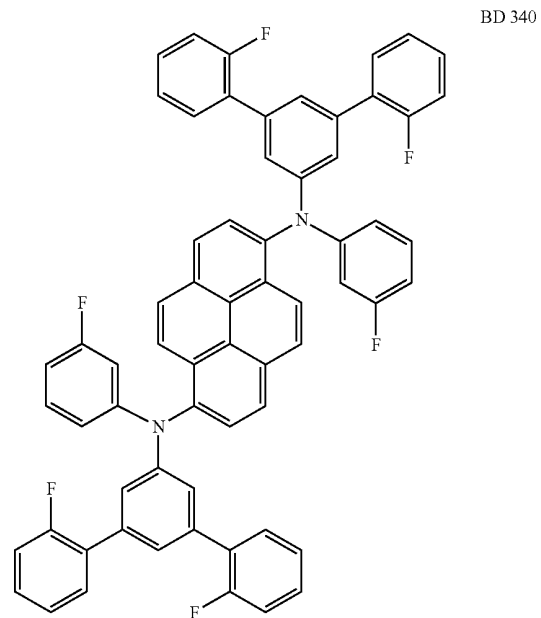
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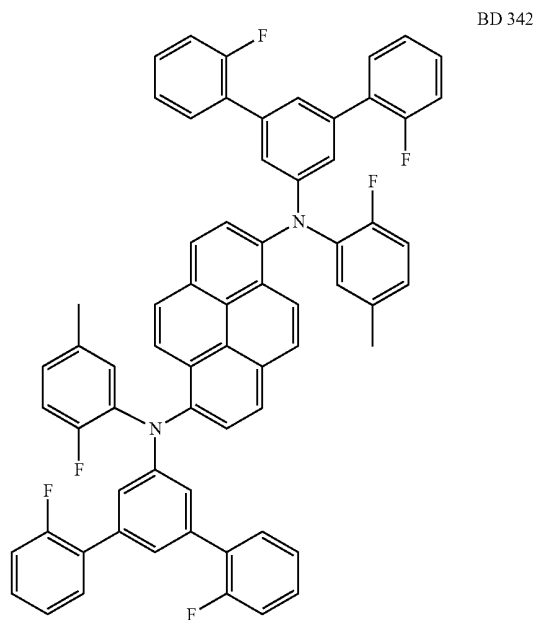
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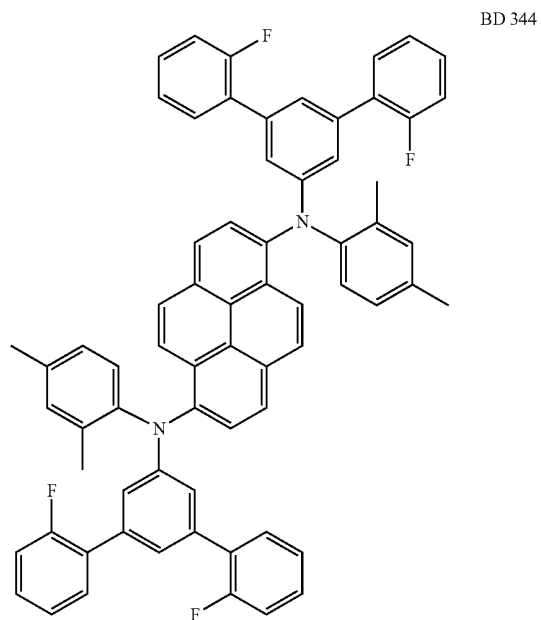
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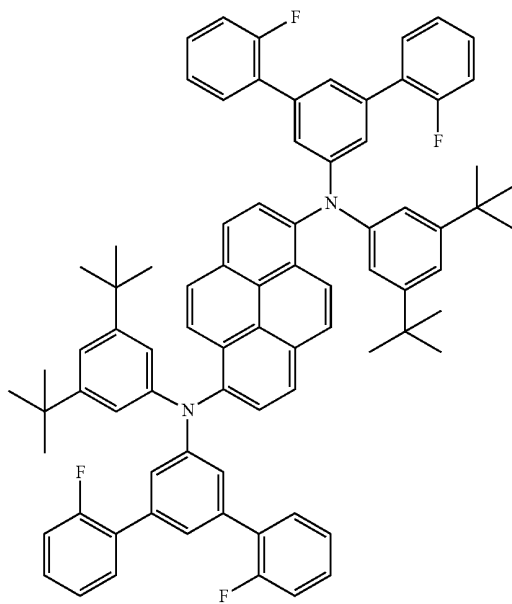
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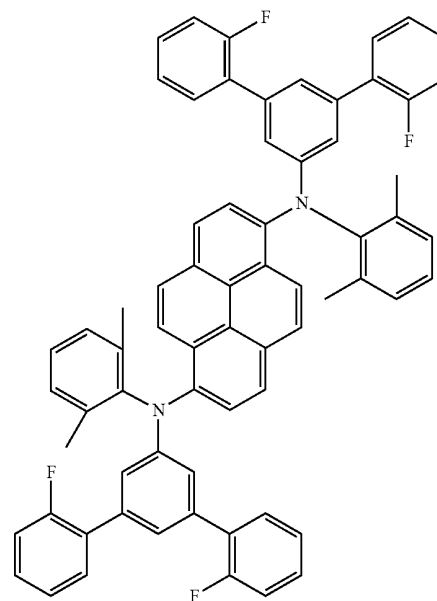
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BD 343

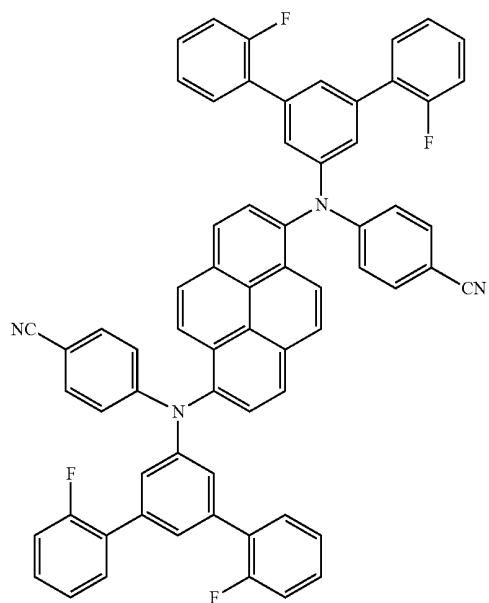


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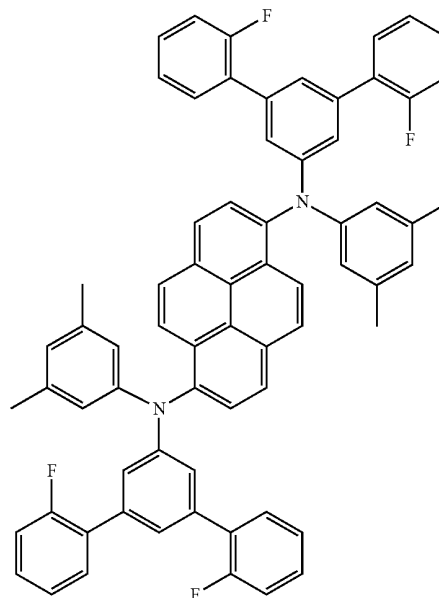
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BD 346

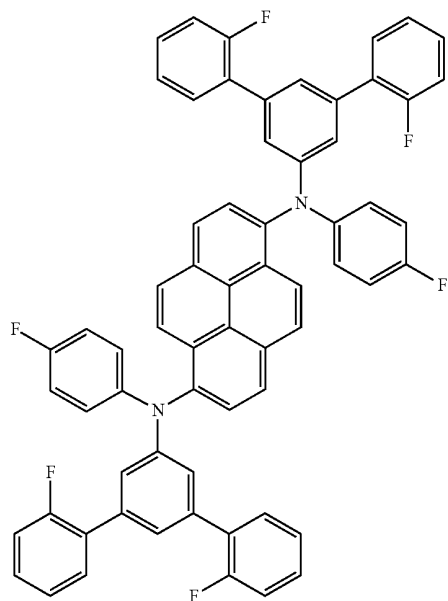


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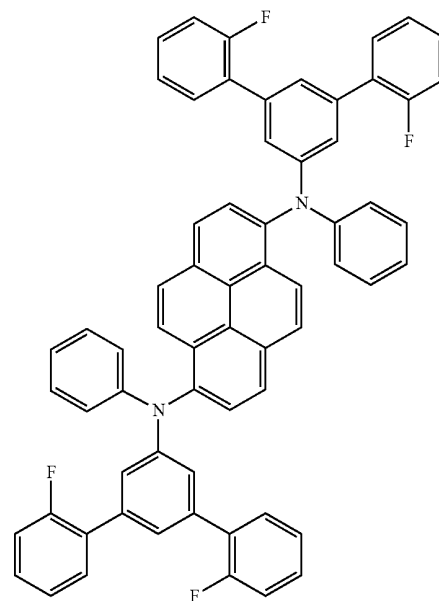
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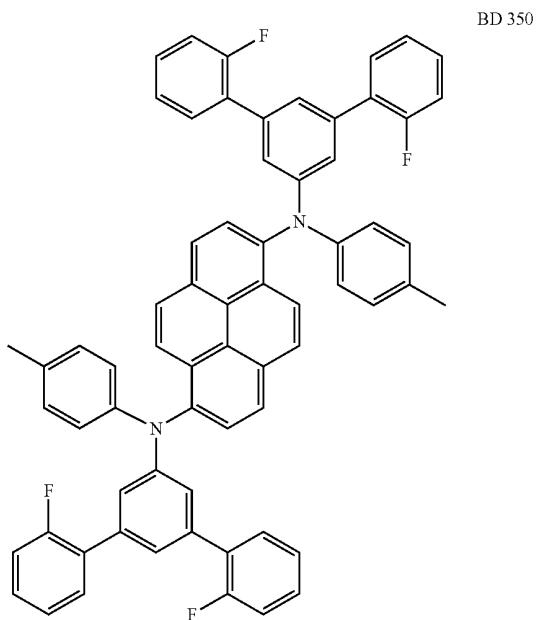
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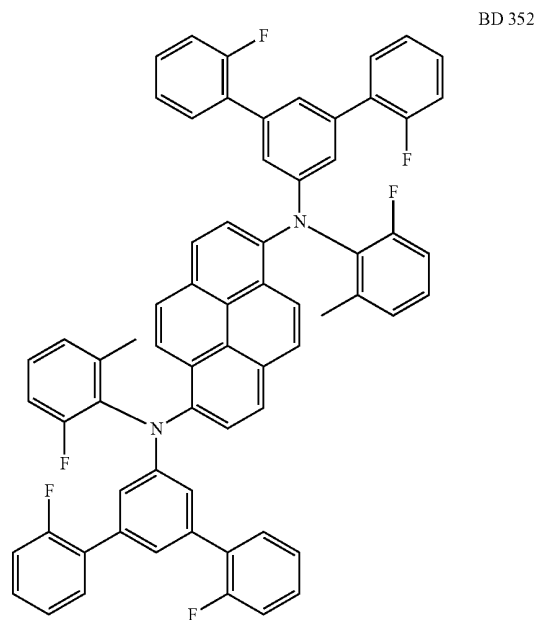
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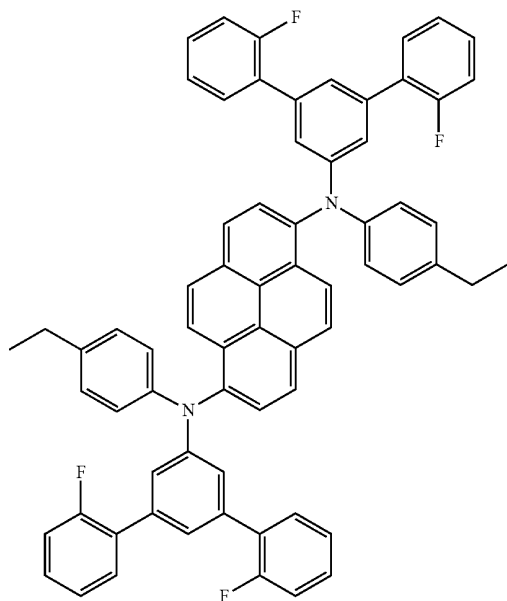
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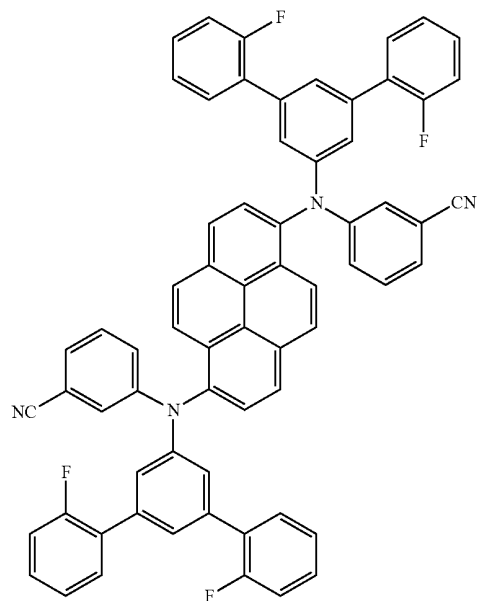
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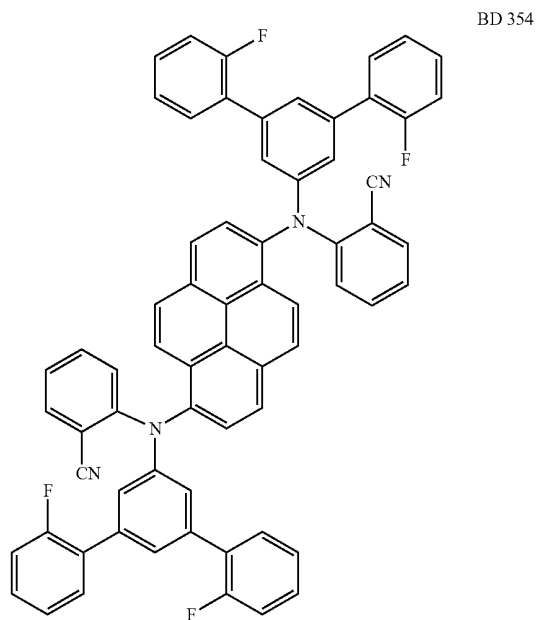
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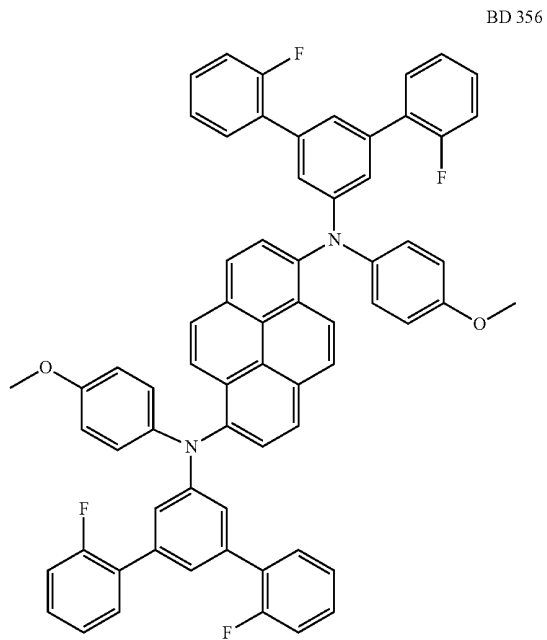
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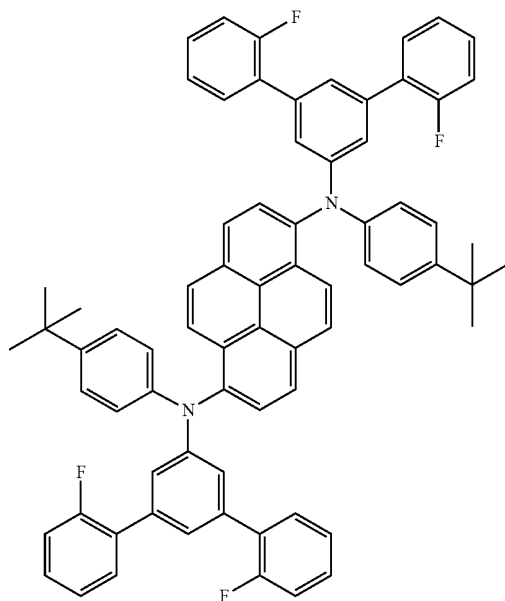
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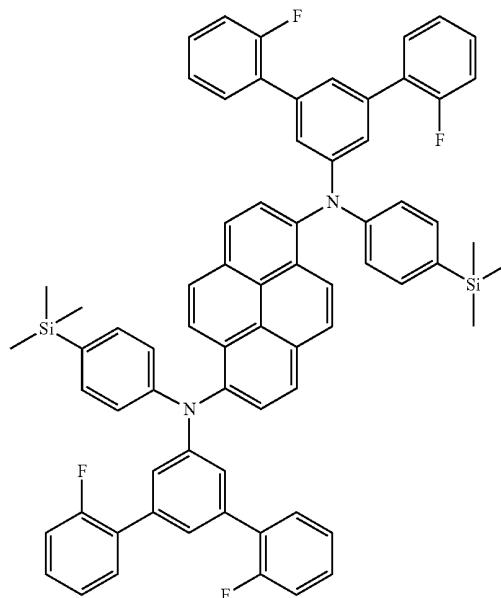
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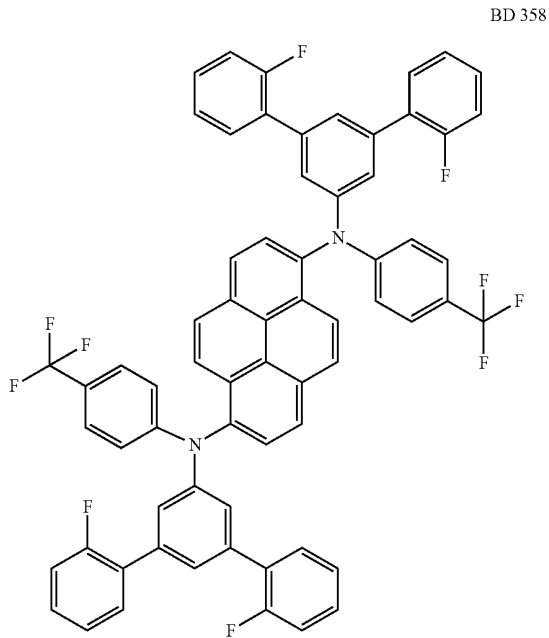
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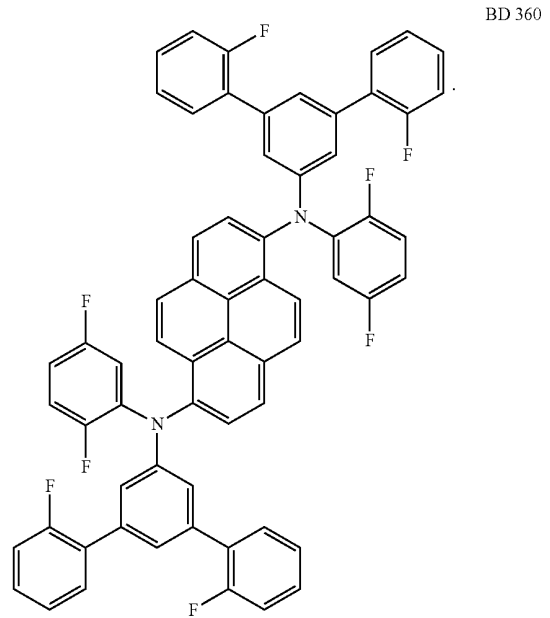
BD 357



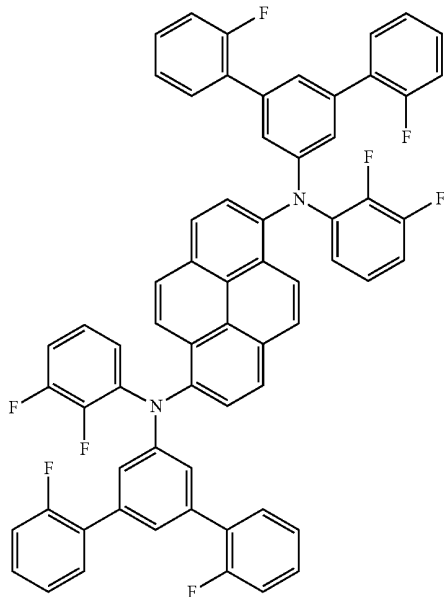
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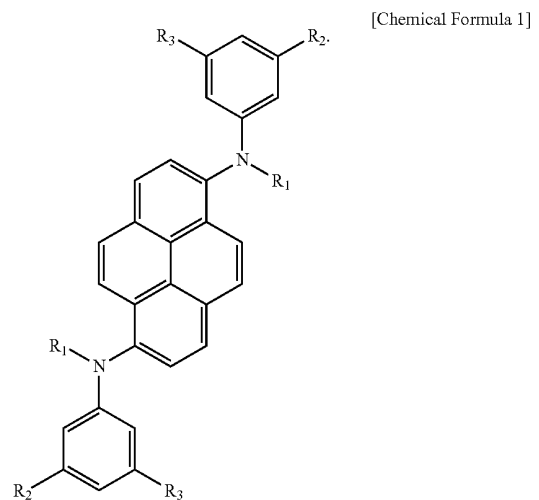
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BD 359



6. An organic electroluminescence device of a blue fluorescence compound, having an electroluminescence layer between a cathode and an anode, the electroluminescence layer comprising a dopant substance and a host substance, wherein the dopant substance has the following chemical formula 1:



7. The device as claimed in claim 6, wherein each of the R1, R2, and R3 is one of substances selected from biphenyl, naphthyl, phenanthrene, terphenyl, pyridine, quinoline, deuterium, and a substituent thereof, independently.

8. The device as claimed in claim **6**, wherein the aromatic group is an aromatic compound having alkyl, alkoxy, halogen, cyano, or silyl group,

wherein the alkyl group is one selected from methyl, ethyl, propyl, i-propyl, and t-butyl,

the alkoxy group is one selected from methoxy, ethoxy, and butoxy,

the halogen group is one selected from fluorine and chlorine, and

the silyl group is trimethylsilyl.

9. The device as claimed in claim **6**, wherein the dopant substance is a compound selected from the BD-1~BD-360 recited in claim **5**.

10. The device as claimed in claim **6**, further comprising a hole injection layer and a hole transport layer formed between the anode and the electroluminescence layer in succession, and an electron transport layer and an electron injection layer formed between the electroluminescence layer and the cathode in succession.

* * * * *

专利名称(译)	蓝色荧光化合物和使用其的有机电致发光器件		
公开(公告)号	US20110156011A1	公开(公告)日	2011-06-30
申请号	US12/858372	申请日	2010-08-17
[标]申请(专利权)人(译)	BIN JONG关 CHA SOON旭 李承JAE PARK CHUN GUN		
申请(专利权)人(译)	BIN , JONG-KWAN CHA , 很快就旭 LEE , SEUNG-JAE KIM , JUNG-瑾 PARK , CHUN-GUN		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	BIN JONG KWAN CHA SOON WOOK LEE SEUNG JAE KIM JUNG KEUN PARK CHUN GUN		
发明人	BIN, JONG-KWAN CHA, SOON-WOOK LEE, SEUNG-JAE KIM, JUNG-KEUN PARK, CHUN-GUN		
IPC分类号	H01L51/54 C07C211/61 C07C255/58 C07F7/10		
CPC分类号	C07C211/61 C07C217/92 C07C255/58 C07C2103/50 C07F7/0818 H05B33/14 C09K2211/1007 C09K2211/1011 C09K2211/1014 H01L51/006 H01L51/5012 C09K11/06 C07C2603/50 C07F7/081		
优先权	1020090132606 2009-12-29 KR		
其他公开文献	US9126892		
外部链接	Espacenet USPTO		

摘要(译)

蓝色荧光化合物本发明涉及一种能够实现高亮度，长寿命和高效率的蓝色荧光化合物;及其有机电致发光器件。

