公司简介 Company profile

东莞伏安光电科技有限公司成立于 2019 年，位于广东省东莞市松山湖国际创新创业社区，是一家致力于开发具有自主产权和特色有机光电功能材料体系的高新技术企业。

Dongguan VOLT-AMP Optoelectronic Technology Co., Ltd., founded in 2019 and located in Songshan Lake international innovation and entrepreneurship community, Dongguan City, Guangdong Province, is a high-tech enterprise committed to developing specialized organic optoelectronic functional material systems with independent property rights.

产品服务 Products & services

我们拥有化学实验室、材料测试实验室、超净室、多条材料加工成型工艺线等配套设施，总占地面积超过 5500 平方米，能够为客户定制、开发、设计和合成新材料，并可提供材料验证服务。

Covering a total area of more than 5500 ㎡, our company has chemical laboratories, material testing laboratories, clean rooms, multiple material processing and forming process lines and other supporting facilities. It can customize, develop, design and synthesize new materials for customers, and provide material verification services.

人员组成 Members

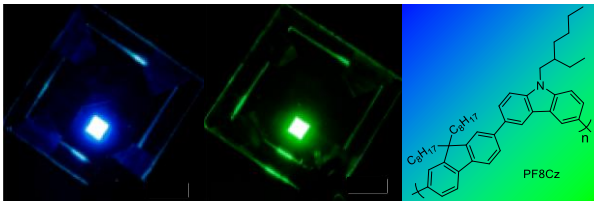
截至 2022 年 12 月份，我们拥有超过 60 名员工，其中中国科学院院士、长江学者、国家杰青等技术专家 20 余人。

As of December 2022, our company has more than 60 employees. Over 20 of them are technical experts, including academicians of Chinese Academy of Sciences, Yangtze River Scholars and Distinguished Young Scholars.

近期新闻 Latest news

2021 年，我司申报成为国家高新技术企业及科技型中小企业。

2022 年，我司技术团队合成新型高性能空穴传输材料 PF8Cz。



2022 年，我司获得了松山湖创新创业大赛总决赛特等奖，获得了最高 600 万元的天使投资机会。

2022 年，我司完成了由北京国管旗下顺禧创投基金领投的近亿元 Pre-A 轮融资。

In 2021, we were recognized as a national high-tech enterprise and a technology-based small and medium-sized enterprise.

In 2022, our technical team has successfully synthesized PF8Cz, a new high-performance hole transport material.

In 2022, our company ranked No.1 in the final of Songshan Lake Innovation and Entrepreneurship Competition, which could bring an angel investment of up to 6 million yuan.

In 2022, we completed nearly 100 million yuan of pre-A financing led by Shunxi venture capital fund under Beijing state owned Capital Operation Management Co., Ltd.

产 品 目 录

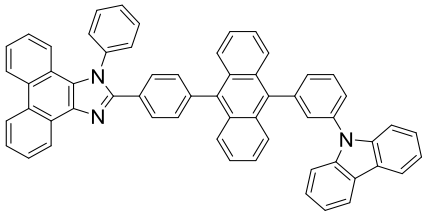
OLED 材料

OLED 材料不断发展，从传统荧光材料，发展到磷光材料，目前伏安光电专注于发展新一代的具有自主知识产权的有机发光材料——热激子发光材料。更多发光材料均可定制合成。

O001 PAC 蓝光材料

2-(4-(10-(3-(9H-carbazol-9-yl)phenyl)anthracen-9-yl)phenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole

CAS 2414547-46-7

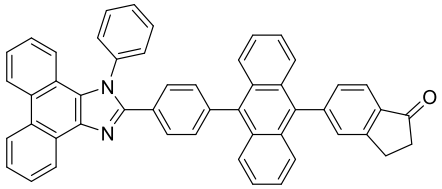


O002 PAIDO 蓝光材料

5-(10-(4-(1-phenyl-1H-phenanthro[9,10-d]imidazol-2-yl)phenyl)anthracen-9-yl)-2,3-dihydro-1H-inden-1-one

CAS 1398384-47-8

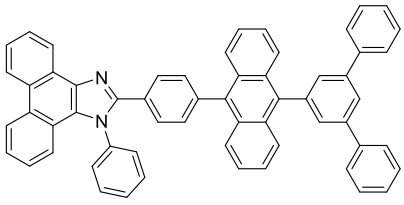
Grade ＞99%，Sublimed



O003 蓝光材料

2-(4-(10-([1,1':3',1''-terphenyl]-5'-yl)anthracen-9-yl)phenyl)-1-phenyl-1H-phenanthro[9,10-d]imidazole

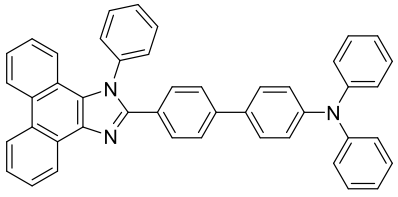
CAS 2639255-13-1



O004 TPA-PPI 蓝光材料

N,N-diphenyl-4'-(1-phenyl-1H-phenanthro[9,10-d]imidazol-2-yl)-[1,1'-biphenyl]-4-amine

CAS 1398384-47-8

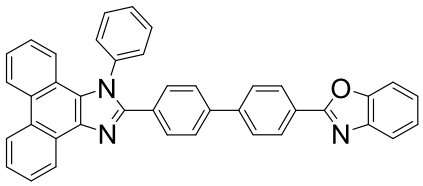


PPIPBO 蓝光材料

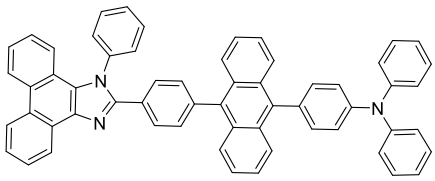
2-(4'-(1-phenyl-1H-phenanthro[9,10-d]imidazol-2-yl)-[1,1'-biphenyl]-4-yl)benzo[d]oxazole

Reference Adv. Optical Mater. 2023, 11, 2202947.

基于 PPIPBO 非掺杂的蓝光 OLED 器件的最大外量子效率（EQE）高达 12.0%。



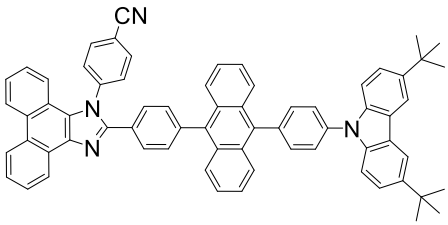
O005 TPAAnPI



tBuPCAPICN 蓝光材料

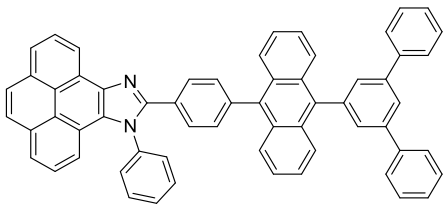
4-(2-(4-(10-(4-(3,6-di-tert-butyl-9H-carbazol-9-yl)phenyl)anthracen-9-yl)phenyl)-1H-phenanthro[9,10-d]imidazol-1-yl)benzonitrile

Reference 基于 tBuPCAPICN 分子为发光层制备了非掺杂 OLED 器件，实现了电致发射峰位于 452nm，半峰宽为 53 nm，色坐标 CIE 为(0.15, 0.11）的纯蓝 OLED 器件。



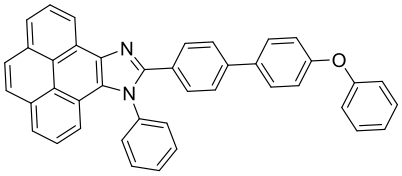
O006 蓝光材料

10-(4-(10-([1,1':3',1''-terphenyl]-5'-yl)anthracen-9-yl)phenyl)-9-phenyl-9H-pyreno[4,5-d]imidazole



O007 | Pypo

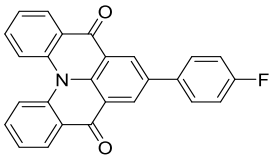
Grade > 99%，Sublimed



O008 | QA-PF 蓝光材料

7-(4-fluorophenyl)quinolino[3,2,1-de]acridine-5,9-dione

CAS 2622773-09-3

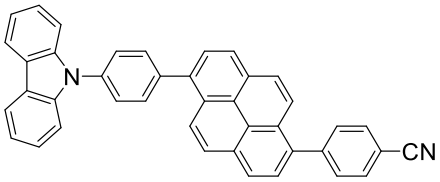


O009 | CPPCN 蓝光材料

4-(6-(4-(9H-carbazol-9-yl)phenyl)-3a[1],9-dihydropyren-1-yl)benzonitrile

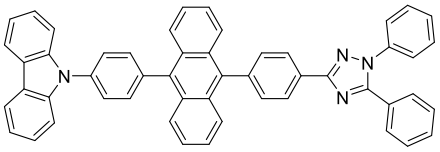
Grade > 99%，Sublimed

Reference Adv. Optical Mater. 2023, 11, 2202217.



| CAT

Grade > 99%，Sublimed

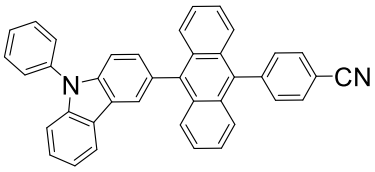


O010 | 3CzAnBzt 蓝光材料

4-(10-(9-phenyl-9H-carbazol-3-yl)anthracen-9-yl)benzonitrile

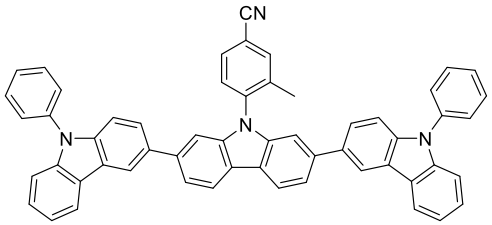
Reference J. Mater. Chem. C, 2019,7, 1014-1021

3CzAnBzt 的最大外量子效率值为 10.06%。在 1000 cd m^{-2} 发光时，EQEs 仍保持在 8.97%。色坐标为（0.14, 0.14）



| 2MCZ-CNMCz

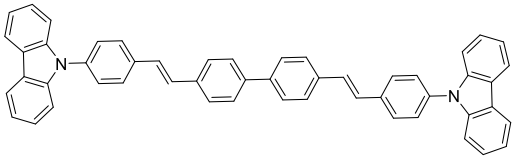
Grade > 99%，Sublimed



| BSB4;BSBCz

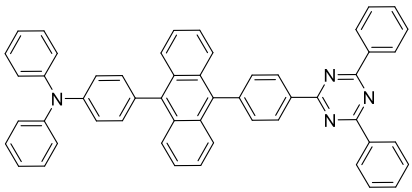
CAS 850594-34-2

Grade > 99%，Sublimed



O011 | TPAAnTAZ 蓝光材料

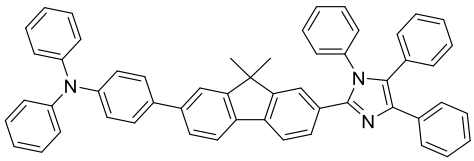
Grade > 99%，Sublimed



O012 | TFPBI 蓝光材料

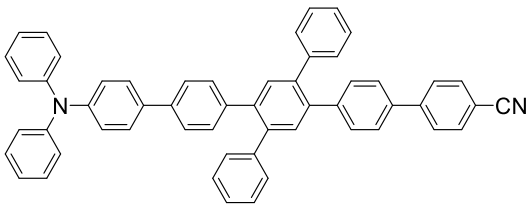
4-(9,9-dimethyl-7-(1,4,5-triphenyl-1H-imidazol-2-yl)-9H-fluoren-2-yl)-N,N-diphenylaniline

CAS 2279165-28-3



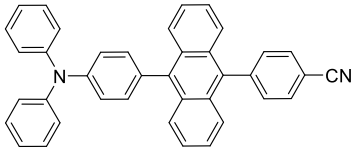
O013 | TPB-PAPC 蓝光材料

4''''-(diphenylamino)-2'',5''-diphenyl-[1,1':4',1'':4'',1''':4''',1''''-quinquephenyl]-4-carbonitrile



| TACN

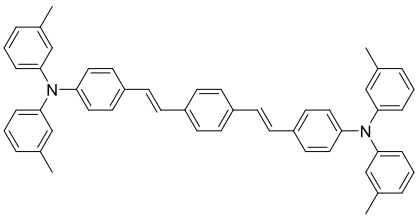
Grade > 99%，Sublimed



O014

CAS 154853-83-5

Grade > 99%，Sublimed

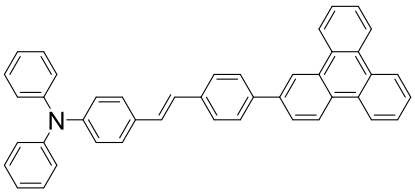


O015 | TSTA 蓝光材料

Reference Chem. Sci., 2016,7, 4044-4051

将 TSTA 掺杂到 DMPPP 主体材料中,最优器件的最大外量子效率、电流效率和功率效率分别为 10.2%、12.3 cd/A 和 5.7 lm/W,发射主峰位于 454 nm,色坐标为(0.14,0.14)

Grade > 99%，Sublimed

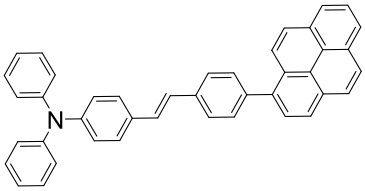


O016 | DPASP 蓝光材料

(E)-N,N-diphenyl-4-(4-(pyren-1-yl)styryl)aniline

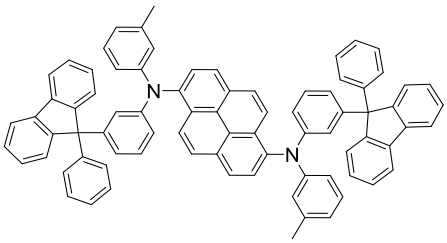
Reference Chem. Sci., 2016,7, 4044-4051

掺杂 DPASP 的以 CBP 作为主体的器件可以实现高达 12%的极高 EQE。



O017 | BD

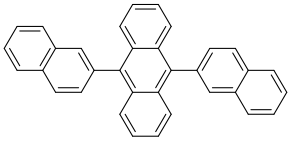
Grade > 99%，Sublimed



O018 | ADN

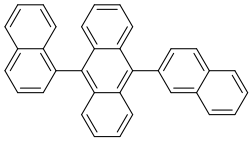
CAS 122648-99-1

Grade > 99%，Sublimed



O019 | α,β-ADN

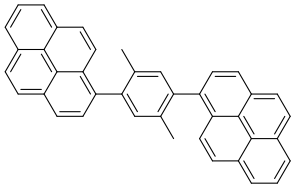
CAS 1030380-38-1



O020 | DMPPP

CAS 1036404-84-8

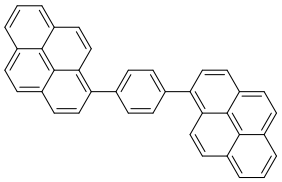
Grade > 99%，Sublimed



O021 | PPP

CAS 475460-77-6

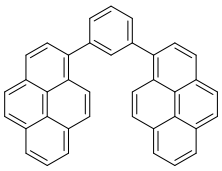
Grade > 99%，Sublimed



O022 | mPPP

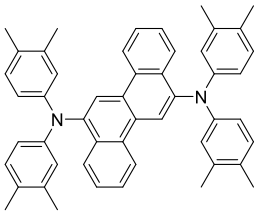
CAS 1644438-20-9

Grade > 99%，Sublimed



O023 | DACrs 蓝光材料

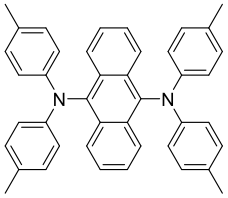
Grade > 99%，Sublimed



O024 | TTPA 蓝光材料

CAS 177799-16-5

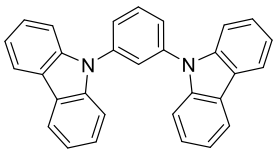
Grade > 99%，Sublimed



O025 | mCP 主体材料

CAS 550378-78-4

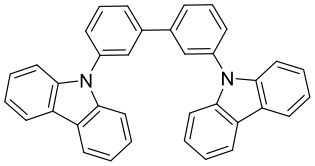
Grade > 99.7%，Sublimed



O026 | mCBP 主体材料

CAS 342638-54-4

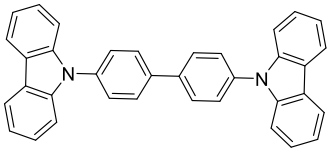
Grade > 99.9%，Sublimed



O027 | CBP 主体材料

CAS 58328-31-7

Grade > 99.9%，Sublimed



O028 | SF3-TRZ 主体材料

2-(9,9'-spirobi[fluoren]-3-yl)-4,6-diphenyl-1,3,5-triazine

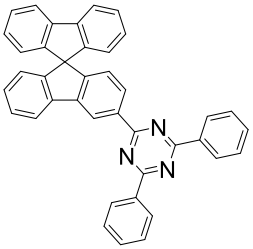
Reference Nat Commun 8, 2250 (2017).

TADF 材料，可作为绿色 OLED 的主体材料，EQE 可达 20.6%。

CAS 1639424-37-5

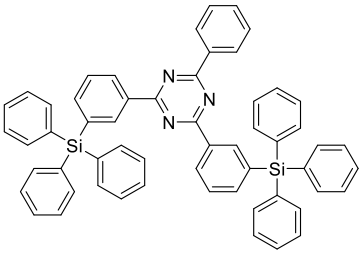
HOMO -6.54 eV

LUMO -3.10 eV



O029 | mSiTrz 主体材料

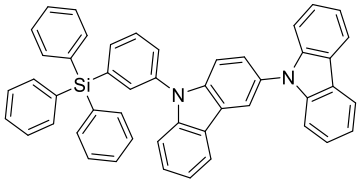
CAS 2252416-90-1



| SiCzCz 主体材料

CAS 2665768-26-1

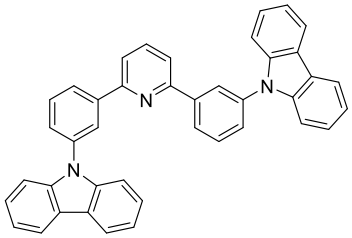
Grade > 99%，Sublimed



O030 | 26DCzPPy 主体材料

CAS 1013405-24-7

Grade > 99%，Sublimed



O031 | TXO-PhCz 绿光材料

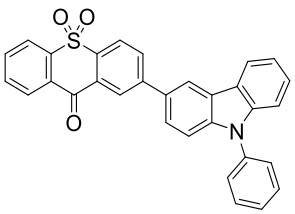
2-(9-phenyl-9H-carbazol-3-yl)-9H-thioxanthen-9-one 10,10-dioxide

CAS 1623010-64-9

Grade > 99%，Sublimed

Reference Adv. Mater., 26(30), 5198-5204 (2014)

HOMO = 5.78 eV, LUMO = 3.58 eV



O032 | TXO-TPA 绿光材料

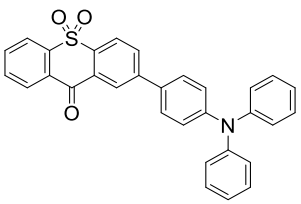
2-(4-(diphenylamino)phenyl)-9H-thioxanthen-9-one 10,10-dioxide

CAS 1623010-63-8

Grade > 99%，Sublimed

Reference Adv. Mater., 26(30), 5198-5204 (2014)

HOMO = 5.37 eV, LUMO = 3.49 eV



O033 | PXZ-TRZ 绿光材料

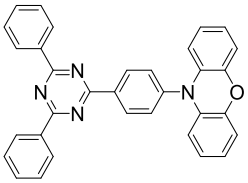
10-(4-(4,6-diphenyl-1,3,5-triazin-2-yl)phenyl)-10H-phenoxazine

CAS 1411910-25-2

Grade > 99%，Sublimed

Reference Chem. Commun., 48, 11392-11394 (2012)

HOMO = 5.5 eV, LUMO = 3.1 eV



O034 | PXZ-DPS 绿光材料

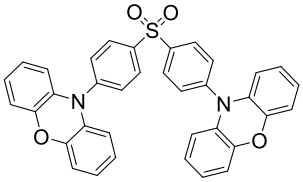
10-(4-(4-(10H-Phenoxazin-10-yl)phenylsulfonyl)phenyl)-10H-phenoxazine

CAS 1477511-57-1

Grade > 99%，Sublimed

Reference Nat. Photonics, 8, 326–332 (2014)

HOMO = 5.59 eV, LUMO = 2.79 eV

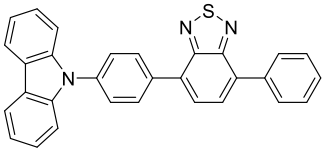


| CzP-BZP 绿光材料

4-(4-(9H-carbazol-9-yl)phenyl)-7-phenylbenzo [c] [1,2,5] thiadiazole

CAS 1864826-67-4

Grade > 99%，Sublimed

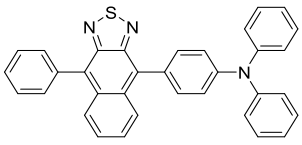


O035 | TPA-NZP 红光材料

N,N-diphenyl-4-(9-phenylnaphtho[2,3-c][1,2,5]thiadiazol-4-yl)aniline

CAS 1439389-33-9

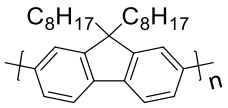
Grade > 99%，Sublimed



O036 | PFO 蓝光聚合物

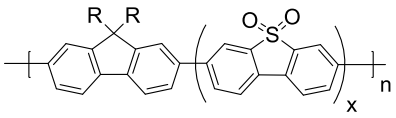
CAS 123864-00-6

Reference Appl. Phys. Lett., 2004, 85, 4576-4578

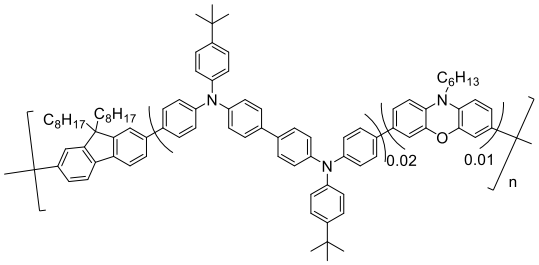


O037 | PFSO 蓝光聚合物

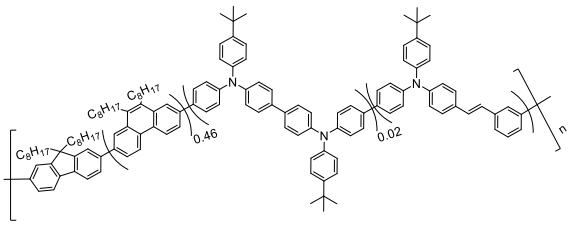
Reference Adv. Funct. Mater., 2013, 23, 4366–4376.



O038 | PF-TD2PO1 蓝光聚合物

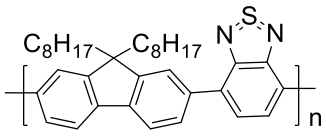


O039 | PF-TD2DV2 蓝光聚合物



O040 | F8BT 绿光聚合物

CAS 210347-52-7

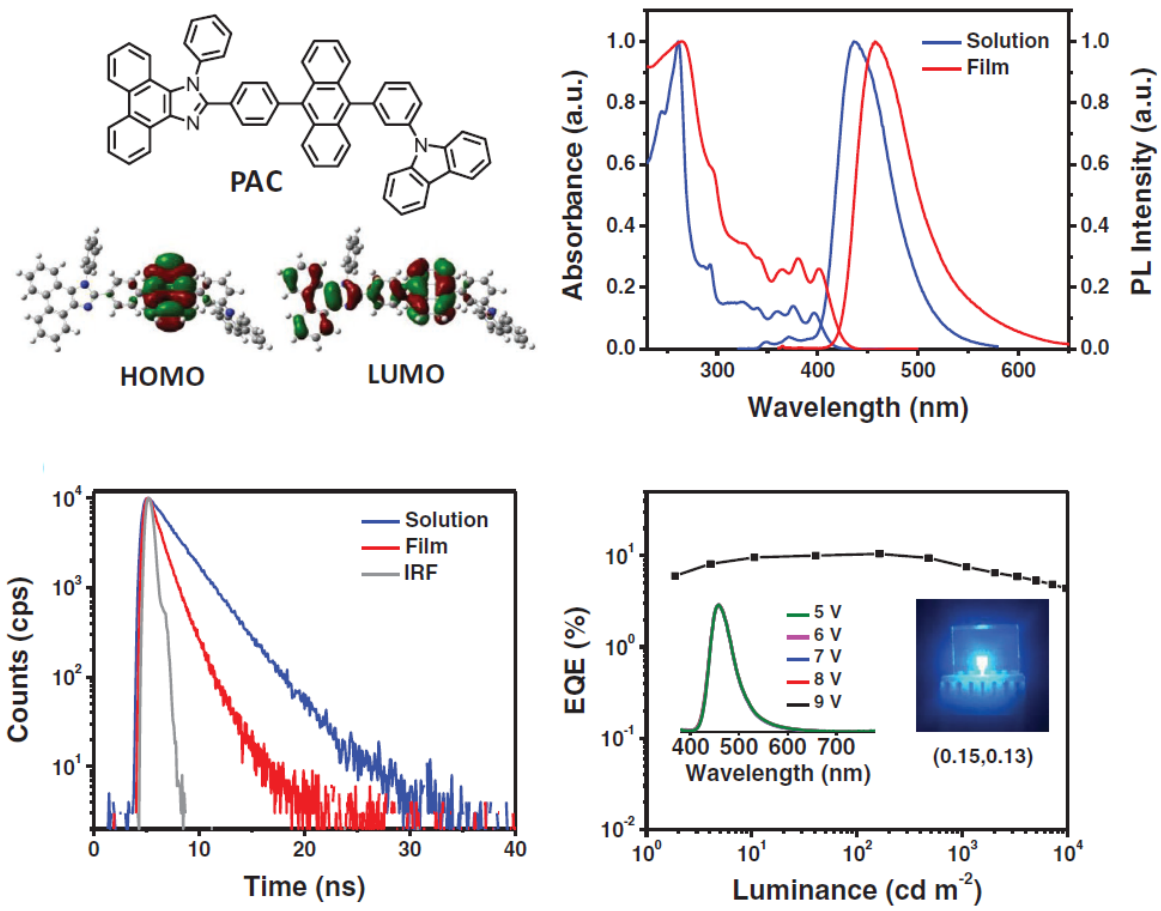


O041 | PFSO 绿光聚合物

O042 | PFSO 绿光聚合物

■ 新一代 OLED 发光材料！热激子蓝光材料 PAC

2019 年，马於光教授研究组基于该组在“热激子”材料长期研究的基础上，设计开发了一个高效的纯蓝光发射的荧光材料 PAC，其非掺杂器件的最大外量子效率（EQE）达到了 10.5%。而且器件具有非常好的稳定性，在 1000 cd m^{-2} 的亮度下，仍然保持 7.5 %的 EQE。瞬态光谱的结果表明材料存在着非常大的 T_2 态和 T_1 态能级差，而 T_2 态能级和 S_1 态能级很接近，为高能反隙间窜越提供了可能（$T_2 \rightarrow S_1$）。进一步利用酮直接敏化 T2 态能级，观测到了来自 S_1 态的 ns 尺度的延迟发射，从而证明了高能级反系间穿越的存在。通过和马东阁教授研究组合作，对器件的磁场效应，瞬态 EL 光谱的测试研究，证明了 TTA 效应对器件的贡献很小。结合实验数据和理论研究，研究者认为，高的器件性能主要归因为热激子通道对三线态激子的有效利用。该研究为开发高效稳定的新一代发光材料，特别是纯蓝光，深蓝光有机电致发光材料提供了新的设计思路。



Literature and Reviews

1. Highly Efficient Blue Fluorescent OLEDs Based on Upper Level Triplet–Singlet Intersystem Crossing. Adv. Mater. 2019, 31, 1807388. https://doi.org/10.1002/adma.201807388

电子传输层

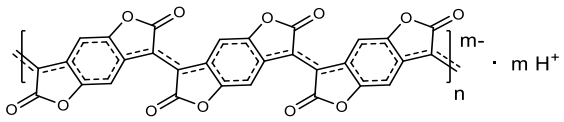
ET001 | PBFDO; Poly(benzodifurandione)

高导 n 型聚合物 Highly conductive n-type polymer

Reference Nature, 611, 271–277 (2022)

conductivity > 1000 S/cm

Concentration 10-12mg/ml（DMSO Solution）



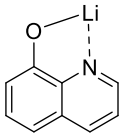
ET002 | Liq

8-羟基喹啉-锂

8-Hydroxyquinolinolato-lithium

CAS 850918-68-2

Grade > 99%，Sublimed



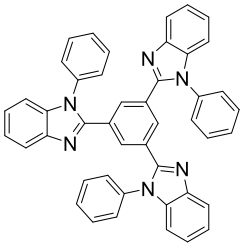
ET003 | TPBi

1,3,5-三(1-苯基-1H-苯并咪唑-2-基)苯

1,3,5-Tri(m-pyridin-3-ylphenyl)benzene

CAS 192198-85-9

Grade > 99.9%，Sublimed



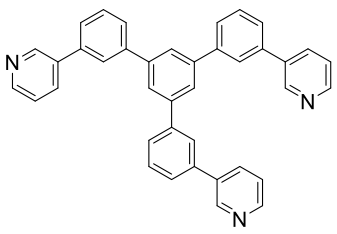
ET004 | TmPYPB

3,3'-[5'-[3-(3-吡啶基)苯基][1,1':3',1''-三联苯]-3,3''-二基]二吡啶

3,3'-[5'-[3-(3-Pyridinyl)phenyl][1,1':3',1''-terphenyl]-3,3''-diyl]bispyridine

CAS 921205-03-0

Grade > 99.7%，Sublimed



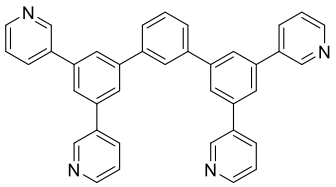
ET005 | BmPyPhB (B3PyPB)

1,3-双(3,5-二吡啶-3-基苯基)苯

1,3-bis[3,5-di(pyridin-3-yl)phenyl]benzene

CAS 1030380-38-1

Grade > 99%，Sublimed



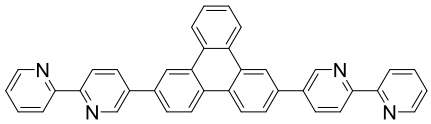
ET006 | BPy-TP2

2,7-Di(2,2'-bipyridin-5-yl)triphenylene

Reference J. Mater. Chem., 2012, 22, 20689–20695

CAS 1394813-58-1

Grade > 99%，Sublimed

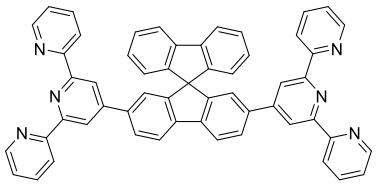


ET007 | 27TPSF

Reference

CAS 2812576-78-4

Grade > 99%，Sublimed



ET008 |

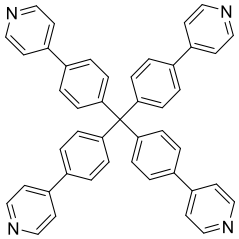
四(4-吡啶联苯基)甲烷

Tetrakis[4-(4-phenylphenyl)pyridine]methane

Reference Angewandte Chemie, International Edition (2013), 52(47), 12395-12399

CAS 1319736-15-6

Grade > 99%，Sublimed



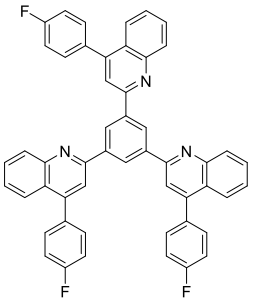
ELECTRON TRANSPORT LAYER

ET009 | TFQB

Reference Advanced Functional Materials, 2011, 21(20):3889-3899.

CAS 1350742-67-4

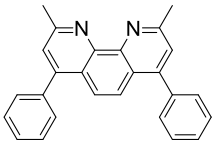
Grade > 99%，Sublimed



ET010 | BCP

CAS 4733-39-5

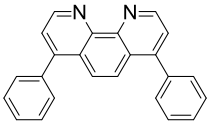
Grade > 99%，Sublimed



ET011 | BPhen

CAS 1662-01-7

Grade > 99%，Sublimed

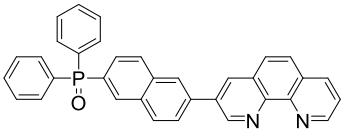


ET012 | Phen-NaDPO

Reference Adv. Funct. Mater., 24: 6540-6547.

CAS 1480371-38-7

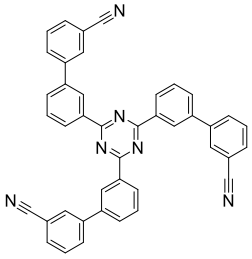
Grade > 99%，Sublimed



ET013 | CN-T2T

CAS 1872292-95-9

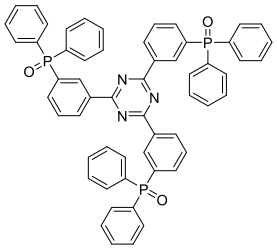
Grade > 99%，Sublimed



ET014 | PO-T2T

CAS 1646906-26-4

Grade > 99%，Sublimed

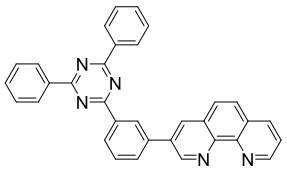


ET015 | TRZ-m-phen

Reference Science Bulletin, Volume 63, Issue 7, 15 April 2018, Pages 446-451

CAS 2244035-12-7

Grade > 99%，Sublimed



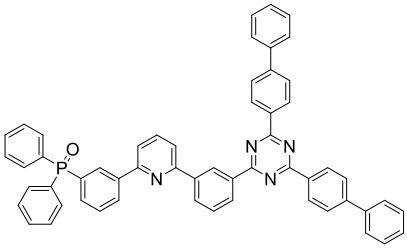
ET016 | BPTRZ-Py-TPO

Reference Sci. China Chem. 63, 904–910 (2020).

CAS 2366141-56

能级 HOMO = -6.45 eV, LUMO = -3.06 eV

Grade > 99%，Sublimed



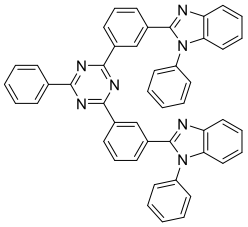
ELECTRON TRANSPORT LAYER

ET017 | A2

Reference J. Mater. Chem. C, 2020, 8, 2700-2708

CAS 2126846-63-5

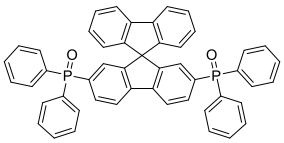
Grade > 99%，Sublimed



ET018 | SPPO13

CAS 1234510-13-4

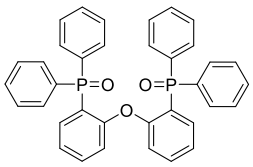
Grade > 99%，Sublimed



ET019 | DPEPO

CAS 808142-23-6

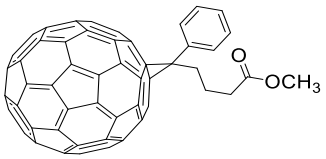
Grade > 99%，Sublimed



ET020 | PC61BM

[6,6]-Phenyl C61 butyric acid methyl ester

CAS 160848-22-6



空穴传输层

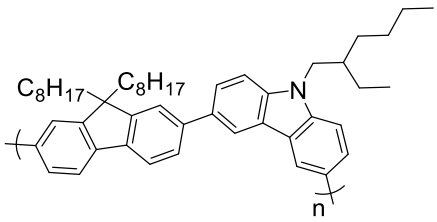
HT001 | PF8Cz

poly((9,9-dioctylfluorenyl-2,7-diyl)-alt-(9-(2-ethylhexyl)-carbazole-3,6-diyl))

Reference Nat. Photon. (2022).

DOI 10.1038/s41566-022-00999-9

Grade High molecular weight



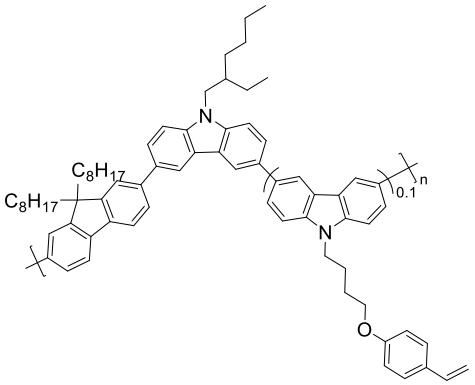
HT002 | PF8Cz-X

poly((9,9-dioctylfluorenyl-2,7-diyl)-co-(9-(2-ethylhexyl)-carbazole-3,6-diyl)-co-(9-(4-(4-vinylphenoxy)butyl)-carbazole-3,6-diyl))

Reference Nano Research, 2025, 10.26599/NR.2025.94907407

DOI 10.26599/NR.2025.94907407

Grade High molecular weight



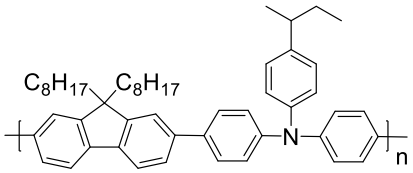
HT003 | TFB

Poly[(9,9-dioctylfluorenyl-2,7-diyl)-co-(4,4'-(N-(4-sec-butylphenyl)diphenylamine)

Reference Appl. Phys. Lett., 87, 023506 (2005)

CAS 220797-16-0

Grade Mn > 40000 Crosslinkable



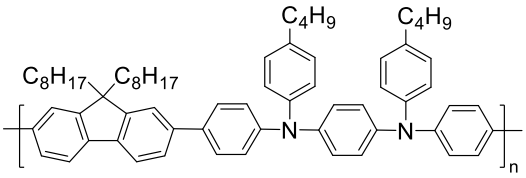
Crosslinkable TFB（可热交联 TFB）also on sale

HT004 | PFB

Poly[[(4-butylphenyl)iMino]-1,4-phenylene[(4-butylphenyl)iMino]-1,4-phenylene(9,9-dioctyl-9H-fluorene-2,7-diyl)-1,4-phenylene]

CAS 223569-28-6

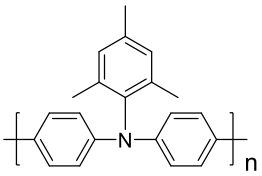
Grade Mn > 40000



HT005 | PTAA

Poly[bis(4-phenyl)(2,4,6-trimethylphenyl)amine]

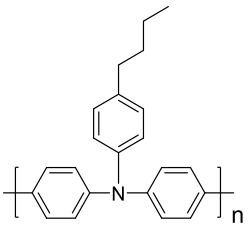
CAS 1333317-99-9



HT006 | Poly-TPD

Poly[bis(4-phenyl)(4-butylphenyl)amine]

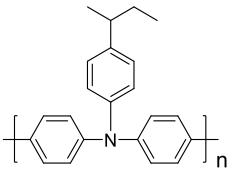
CAS 472960-35-3



HT007 | S-poly-TPD

Poly[4,4′-(N-(4-secbutylphenyl)diphenylamine]

CAS 2243991-97-9



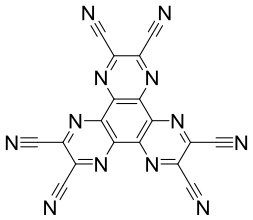
HT008 | HATCN

2,3,6,7,10,11-六氰基-1,4,5,8,9,12-六氮杂苯并菲

Hexaazatriphenylenehexacabonitrile

CAS 105598-27-4

Grade > 99%，Sublimed



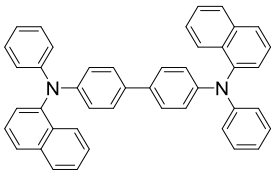
HT009 | NPB

N,N'-二苯基-N,N'-(1-萘基)-1,1'-联苯-4,4'-二胺

N,N'-Bis- (1-naphthalenyl)-N,N'-bis-phenyl-(1,1'-biphenyl)-4,4'-diamine

CAS 123847-85-8

Grade > 99%，Sublimed



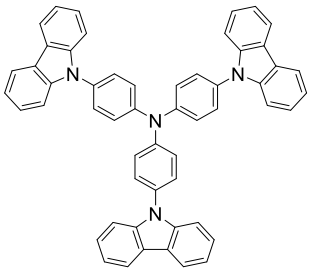
HT010 | TCTA

4,4',4"-三(咔唑-9-基)三苯胺

tris(4-(9H-carbazol-9-yl)phenyl)amine

CAS 139092-78-7

Grade > 99.7%，Sublimed



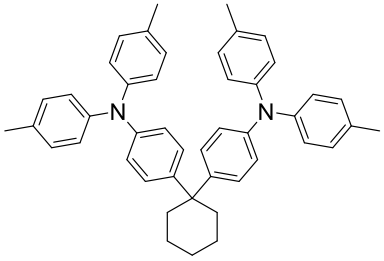
HT011 | TAPC

4,4'-环己基二[N,N-二(4-甲基苯基)苯胺]

1,1-Bis[(di-4-tolylamino)phenyl]cyclohexane

CAS 58473-78-2

Grade > 99.5%，Sublimed



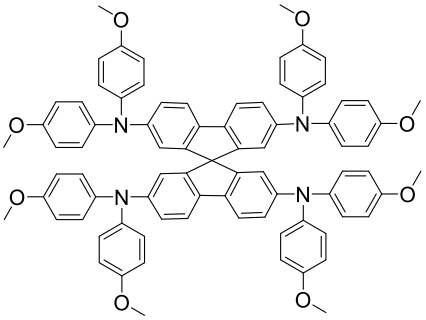
HT012 | Spiro-OMeTAD

2,2',7,7'-四[N,N-二(4-甲氧基苯基)氨基]-9,9'-螺二芴

2,2',7,7'-Tetrakis[N,N-di(4-methoxyphenyl)amino]-9,9'-spirobifluorene

CAS 207739-72-8

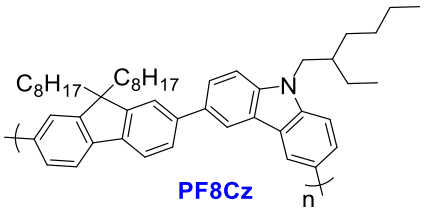
Grade > 99%



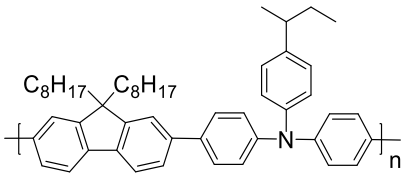
■ Nature Photonics：高性能 QLED 空穴传输材料 PF8Cz

2022 年，浙江大学金一政课题组、王林军课题组与华南理工大学黄飞/应磊团队合作，在高性能蓝、绿光量子点发光二极管（QLED）的开发上取得进展。研究人员发现：有机空穴传输材料能级的能量无序会显著增强量子点/有机空穴传输层界面的电子泄漏，是造成蓝、绿光 QLED 效率损失的关键通道。根据此机制，研究人员通过设计，调控合成方法，合成出高纯度高分子量(影响性能提升的关键因素)的聚合物 PF8Cz。该材料与传统聚合物传输层 TFB 相比，具有更浅的 LUMO 能级与更小的能量无序，因而表现出优异的电子阻挡能力。最终，利用此空穴传输材料，研究团队构筑了高性能蓝、绿光 QLED 原型器件，最高外量子效率分别达 21.9%与 28.7%，且高效率窗口覆盖了从显示到通用照明的亮度范围。蓝、绿光 QLED 分别实现了长达 4400 小时与 580000 小时的工作寿命（100 尼特下亮度衰减 95%），均是目前报道过的 QLED 最高值。

该成果近日以“Solution-processed green and blue quantum-dot light-emitting diodes with eliminated charge leakage”为题发表于 Nature Photonics。浙江大学邓云洲博士、博士生陆遥、博士生朱希童和华南理工大学彭洋博士（东莞伏安光电科技有限公司研发总监）为本文共同第一作者。



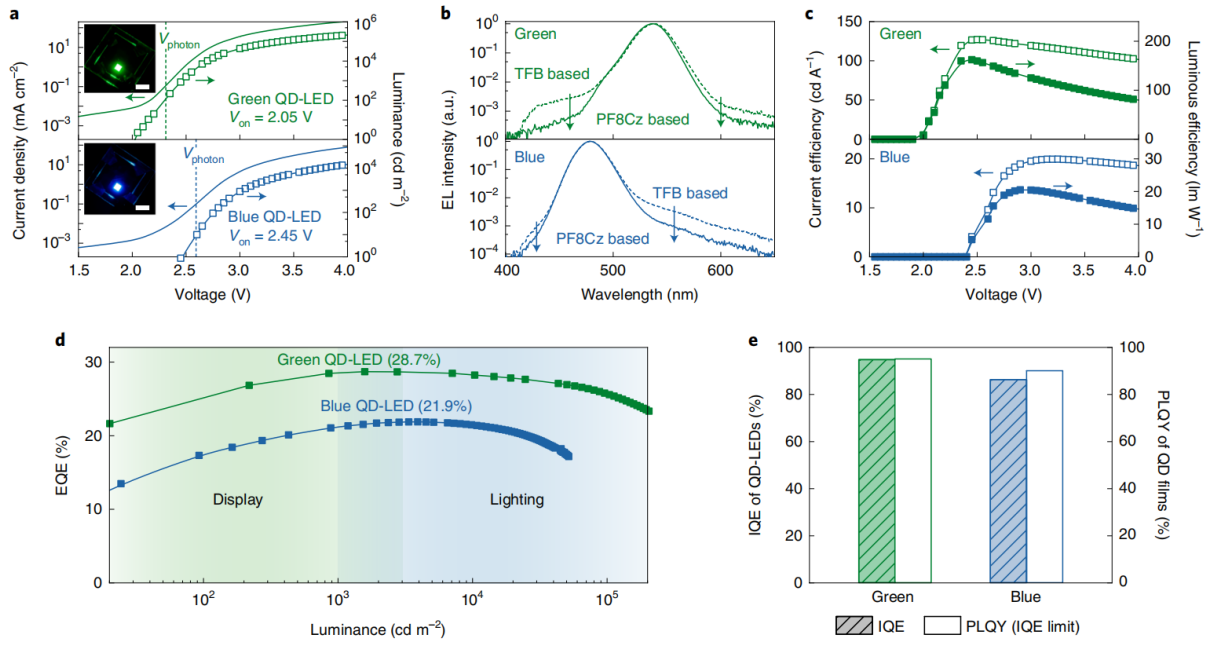
PF8Cz



TFB

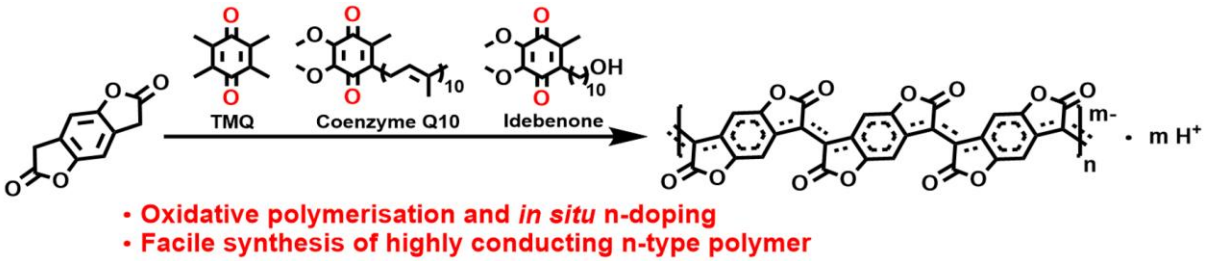
Device structure: indium tin oxide (ITO)/PEDOT:PSS/HTL (TFB or PF8Cz)/QDs/$Zn_{0.85}Mg_{0.15}O$/Al.

TFB or PF8Cz solutions (in chlorobenzene; 8mg ml^{-1} for the green and blue devices and 12mg ml^{-1} for the red devices) were spin coated at 2000 r.p.m. for 45 s and baked at 150 °C for 30min to form the HTLs.

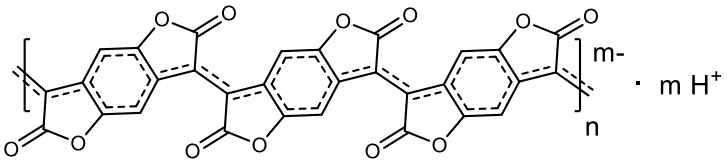


■ Nature：突破进展！超高导 n 型聚合物

华南理工大学发光材料与器件国家重点实验室黄飞教授、曹镛院士、马於光院士团队设计开发了一种可溶液处理、无侧链的 n 型导电高分子聚（苯并双呋喃二酮）（PBFDO），PBFDO 具有创纪录的电导率，可达到 2000 S cm-1 以上，并且具有优异的稳定性，在没有额外的侧链或表面活性剂的情况下具有良好的溶液加工性。基于其超高的 n 型电导率和优良的环境稳定性，PBFDO 在热电器件、有机电化学晶体管以及柔性印刷电极应用上展示了良好的应用前景。该成果以"A solution-processed n-type conducting polymer with ultrahigh Conductivity"为题发表于 Nature。



- **Oxidative polymerisation and *in situ* n-doping**
- **Facile synthesis of highly conducting n-type polymer**

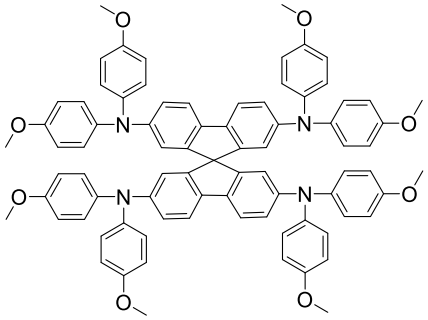
名称：	PBFDO
类型：	N 型导电聚合物
化学结构式：	
性状：	黑红色粘稠状液体，DMSO 溶液（浓度 10-12 mg mL^{-1}）
性能：	电导率>1000 S/cm（涂膜真空干燥后，四探针法测试）
使用方法：	滴涂/旋涂
能级：	还原能级-5.2 eV，功函数 4.7 eV (UPS)
储存要求：	室温储存

钙钛矿光伏材料

PP001 | **Spiro-OMeTAD**

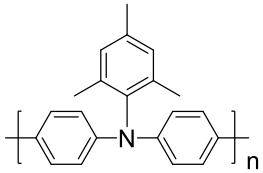
CAS 207739-72-8

Grade > 99%，Sublimed



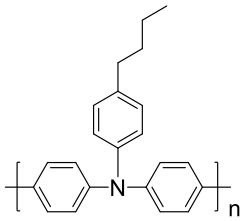
PP002 | **PTAA**

CAS 1333317-99-9



PP003 | **Poly-TPD**

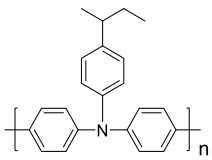
CAS 472960-35-3



PP004 | **S-poly-TPD**

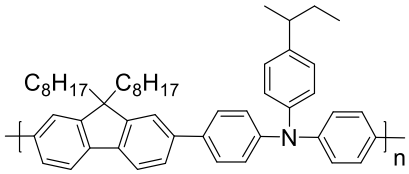
Poly[4,4′-(N-(4-secbutylphenyl)diphenylamine]

CAS 2243991-97-9



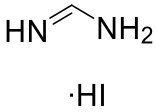
PP005 | **TFB**

CAS 220797-16-0



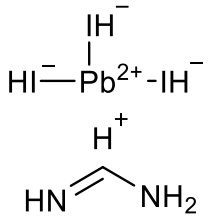
PP006 | **甲脒氢碘酸盐 FAI**

CAS 879643-71-7



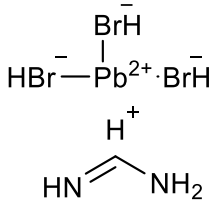
PP007 | **甲脒碘基钙钛矿粉末 $FAPbI_3$**

CAS 1451592-07-6



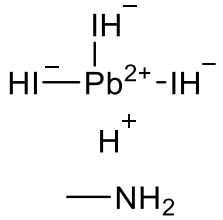
PP008 | **甲脒溴基钙钛矿粉末 $FAPbBr_3$**

CAS 1008105-17-6



PP009 | **甲胺碘基钙钛矿粉末 $MAPbI_3$**

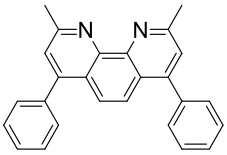
CAS 69507-98-8



PP010 | **BCP**

2,9-Dimethyl-4,7-diphenyl-1,10-phenanthroline

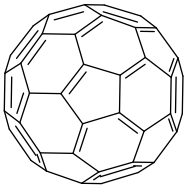
CAS 4733-39-5



PP011 | **C60；Fullerene 升华提纯品**

升华提纯品富勒烯 Fullerene

CAS 131159-39-2

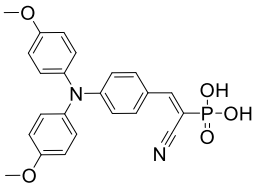


自组装 SAM 材料

SAM001 | **MPA-CPA**

Reference Science, 2023, 380, 404-409

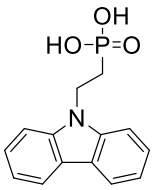
CAS 2971088-37-4



SAM002 | **2PACz**

(2-(9H-carbazol-9-yl)ethyl)phosphonic acid

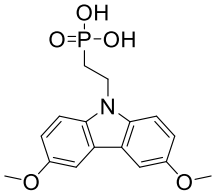
CAS 20999-38-6



SAM003 | **MeO-2PACz**

[2-(3,6-Dimethoxy-9H-carbazol-9-yl)ethyl]phosphonic Acid

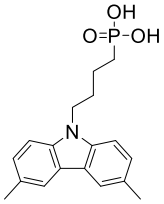
CAS 2377770-18-6



SAM004 | **Me-4PACz**

[4-(3,6-Dimethyl-9H-carbazol-9-yl)butyl]phosphonic Acid

CAS 2747959-96-0

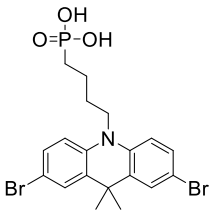


SAM005 | **DMACPA**

(4-(2,7-Dibromo-9,9-dimethylacridin-10(9H)-yl)butyl)

phosphonic acid

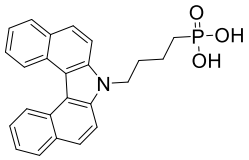
CAS 2971088-37-4



SAM006 | **4PADCB**

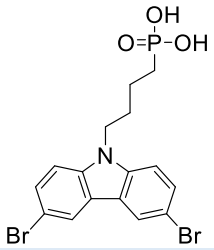
(4-(7H-dibenzo[c,g]carbazol-7-yl)butyl)phosphonic acid

CAS 2882156-63-8



SAM007 | **Br-4PACz**

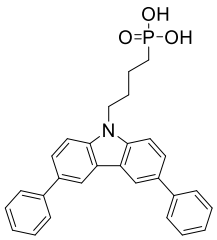
[4-(3,6-Dibromo-9H-carbazol-9-yl)butyl]phosphonic Acid



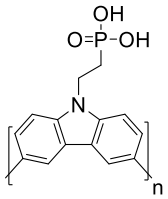
SAM008 | **Ph-4PACz**

(4-(3,6-diphenyl-9H-carbazol-9-yl)butyl)phosphonic acid

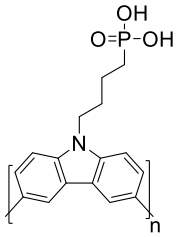
CAS 2814500-04-2



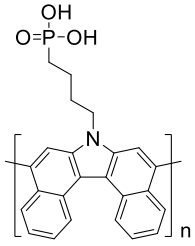
SAM009 | **Poly-2PACz**



SAM010 | **Poly-4PACz**



SAM011 | **Poly-4PADCB**



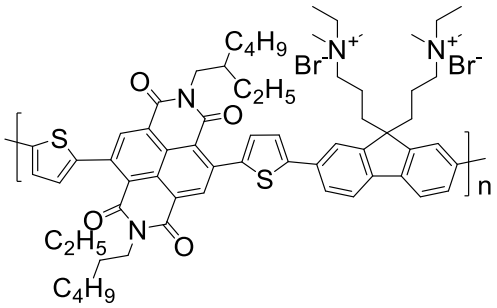
阴极界面层

C001 | PNDIT-F3N-Br

Reference J. Am. Chem. Soc. 2016, 138, 6, 2004

CAS 2169941-79-9

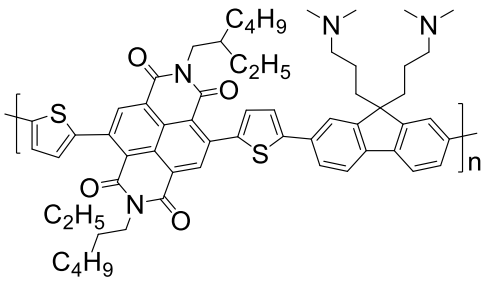
Solubility Soluble in MeOH



C002 | PNDIT-F3N

Reference J. Am. Chem. Soc. 2016, 138, 6, 2004

Solubility Soluble in CH2Cl2, CHCl3, Toluene, MeOH（+ 0.5% AcOH）

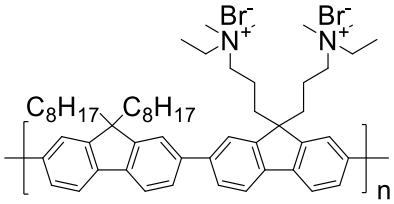


C003 | PFN-Br

Reference Chem. Mater. 2004, 16, 4, 708–716

CAS 889672-99-5

Solubility Soluble in MeOH

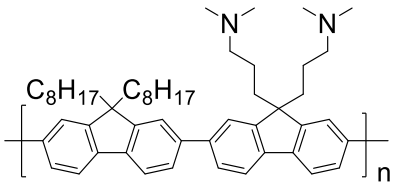


C004 | PFN

Reference Chem. Mater. 2004, 16, 4, 708–716

CAS 673474-74-3

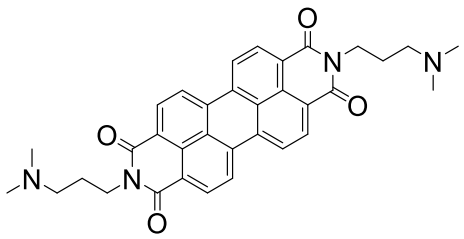
Solubility Soluble in CH2Cl2, CHCl3, Toluene, MeOH（+ 0.5% AcOH）



C005 | PDIN

Reference Energy Environ. Sci., 2014, 7, 1966.

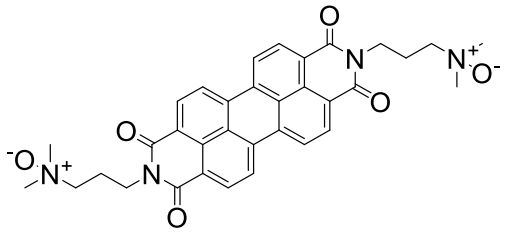
CAS 117901-97-0



C006 | PDINO

Reference Energy Environ. Sci., 2014, 7, 1966.

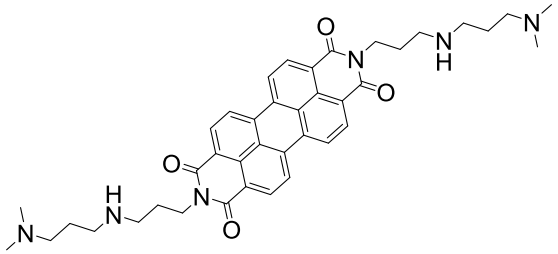
CAS 1558023-86-1



C007 | PDINN

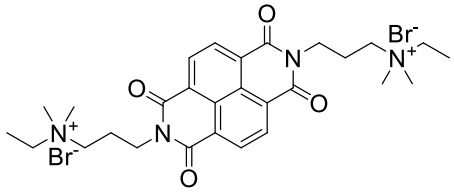
Reference Nat Commun 11, 2726 (2020)

CAS 1020180-01-1



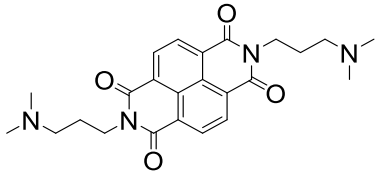
C008 | NDI-N-Br

CAS 81253-99-8



C009 | NDI-N

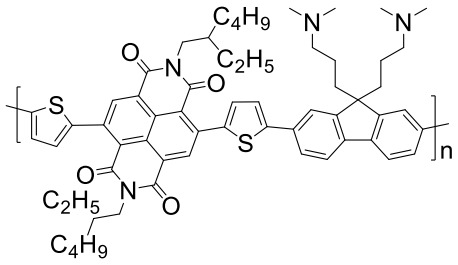
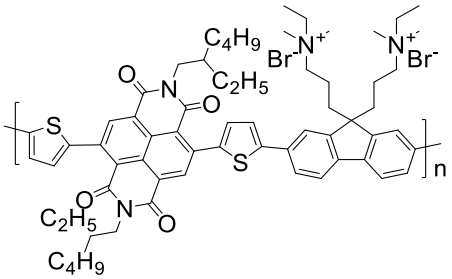
CAS 3436-54-2

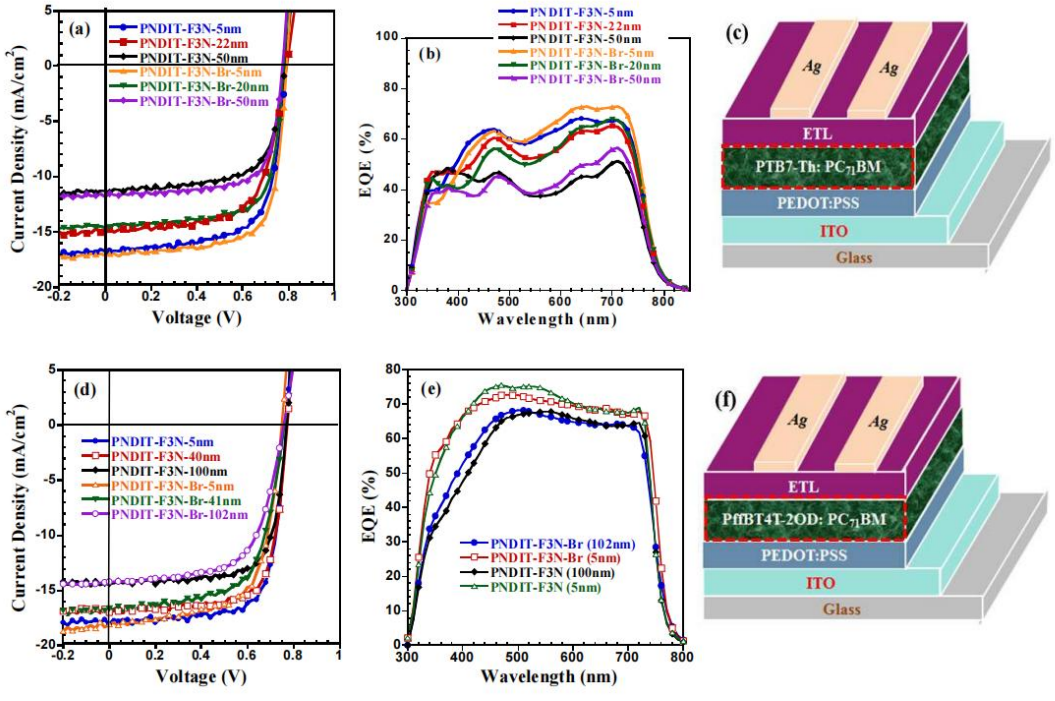


■ 有机光伏 PNDIT-F3N & PNDIT-F3N-Br 阴极界面层

2015 年，华南理工大学的曹镛团队设计了 PNDIT-F3N 及 PNDIT-F3N-Br 阴极界面层材料。其中，PNDIT-F3N-Br 具有自掺杂效应，且该修饰层的膜厚耐受性较强，有利于制备大面积器件。

该成果以“n-Type Water/Alcohol-Soluble Naphthalene Diimide-Based Conjugated Polymers for High-Performance Polymer Solar Cells”为题发表于 Journal of the American Chemical Society。

		
材料名称	PNDIT-F3N	PNDIT-F3N-Br
溶解性	可溶于甲醇和乙醇(>12 mg/mL，需要加 0.5%乙酸助溶)在普通有机溶剂如四氢呋喃(THF)、氯仿、甲苯中均易溶(溶解度>30 mg/ml)。	PNDIT-F3N-Br 不溶于 THF、氯仿、甲苯和水。在乙醇中溶解度有限，在 DMSO 中溶解度良好，甲醇和 DMF。
LUMO	约-3.91 eV	约-4.18 eV
HOMO	约-5.55 eV	约-5.47 eV



OPV DONORS 更多聚合物结构均可定制合成

有机光伏给体

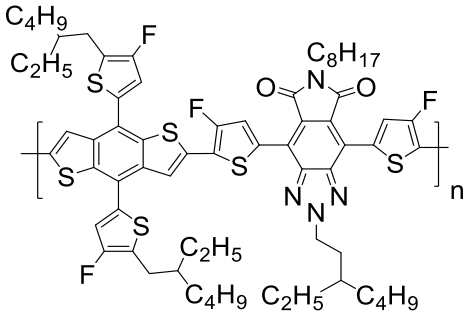
有机太阳能电池的活性层是能量转换过程的关键，一般由电子给体和受体材料共混组成，材料的选择搭配决定器件光伏性能潜力。

D001 | PTzBI-dF

Reference ACS Energy Lett. 2020, 5, 6, 2087–2094

基于活性层PTzBI-dF:L8BO:Y6的器件实现了18.26%的能量转换效率和杰出的热稳定性。

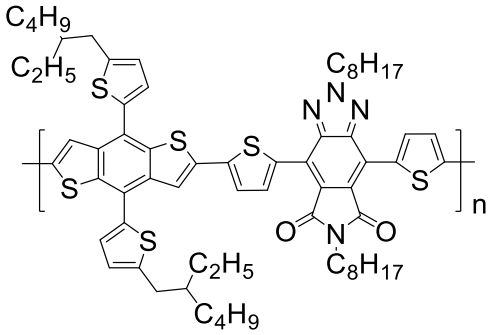
CAS 2626933-88-6



D002 | PTzBI

Reference Adv. Mater. 2017, 29, 1606396.

CAS 1800499-46-0

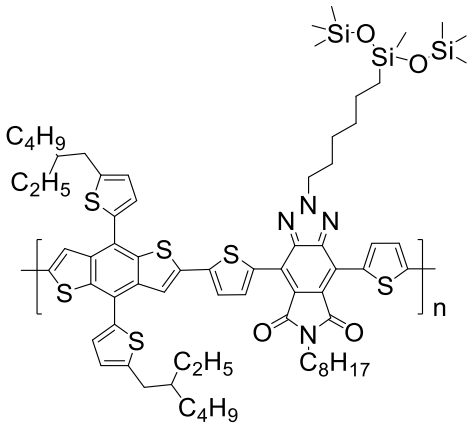


D003 | PTzBI-Si

Reference Adv. Mater. 2019, 31, 1902899.

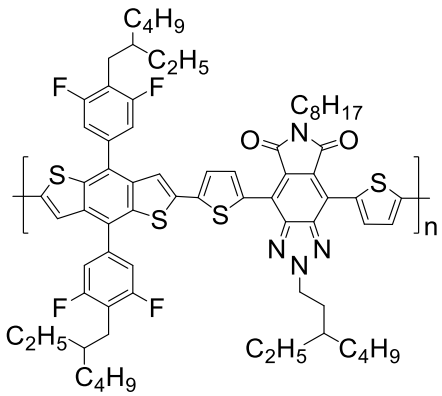
PTzBI-Si：N2200 全聚合物太阳能电池，实现了 11.76%的高功率转换效率。

CAS 2226225-32-5



D004 | P2F-EHp

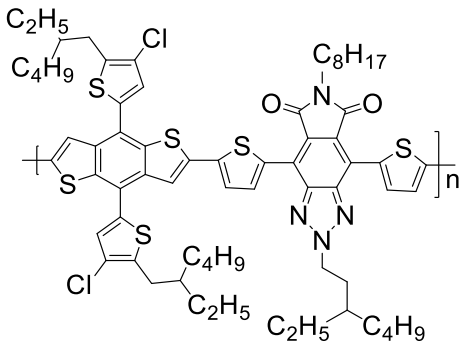
Reference ACS Energy Lett. 2019, 4, 10, 2466–2472



D005 | PTzBI-Cl；PCIT-EHp

Reference J. Mater. Chem. A, 2020,8, 23519-23525

基于 PCIT EHp:Y6 混合物的器件表现出 27.3 mA cm^{-2}的显著电流密度和在 820 nm 波长下接近 100%的高内部量子效率。

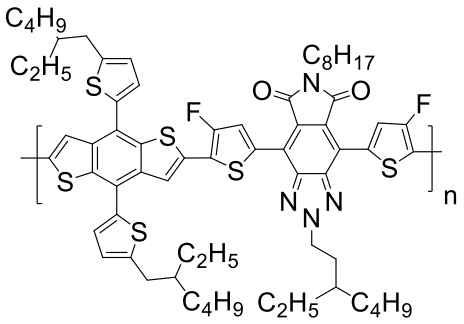


D006 | PTzBI-oF

Reference Adv. Mater. 2019, 31, 1902899.

基于 PTzBI-oF 的全聚合物太阳能电池效率达到 15.11%

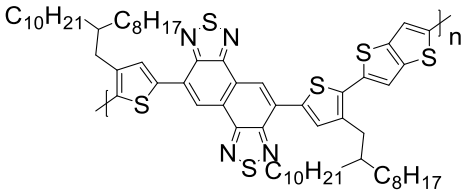
OPV DONORS 更多聚合物结构均可定制合成



D007 | **NT812; NTOD**

Reference Adv. Mater., 28: 9811-9818.

CAS 2100300-49-8



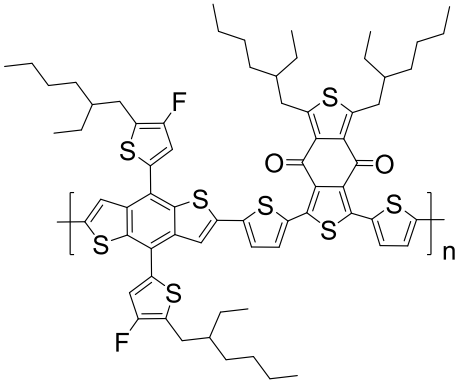
D008 | **PM6**

Reference Adv. Mater. 2015, 27, 4655.

基于 PM6：L8-BO 的 OPV 器件 PCE 突破 18%。伏安光电提供的 PM6 材料经过多所高校验证，品质优异。

CAS 1802013-84-8

能级 HOMO = -5.45 eV, LUMO = -3.65 eV

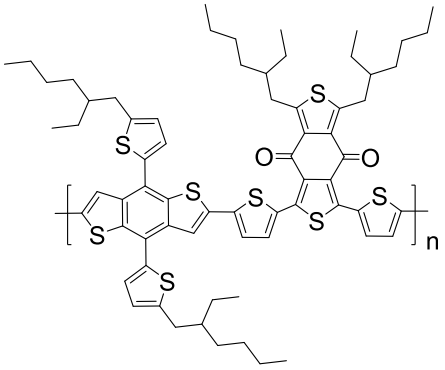


D009 | **PBDB-T; PPBDTBDD**

Reference Adv. Mater., 28, 9423–9429 (2016)

CAS 1415929-80-4

能级 HOMO = -5.33 eV， LUMO = -2.92 eV

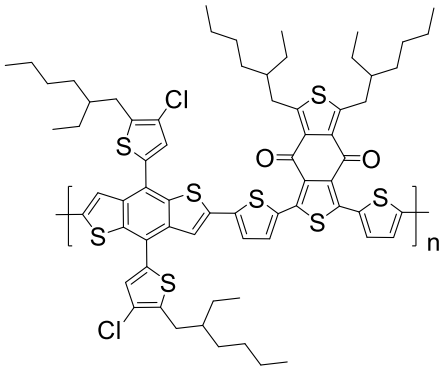


D010 | **PM7; PBDB-T-Cl**

Reference Adv. Mater., 30, 1800868 (2018)

CAS 2239295-71-5

能级 HOMO = -5.52 eV, LUMO = -3.57 eV



D011 | **D18**

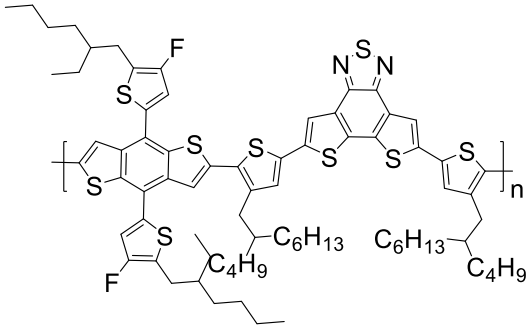
Reference Sci. Bull. 2020, 65, 272.

D18 给体具有高空穴传输率及宽带隙的特性

基于 D18:Y6 的 OPV 器件 PCE 超过 18%。

CAS 2433725-54-1

能级 HOMO = -5.51 eV, LUMO = -2.77 eV



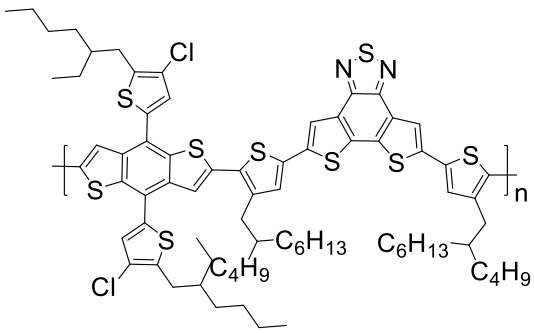
D012 | **D18-Cl**

Reference Adv. Funct. Mater. 2021, 31, 2102413.

D18-Cl 相较 D18 而言，分子量不敏感，批次对器件效率影响较小。

CAS 2433725-53-0

能级 HOMO = -5.56 eV, LUMO = -2.78 eV



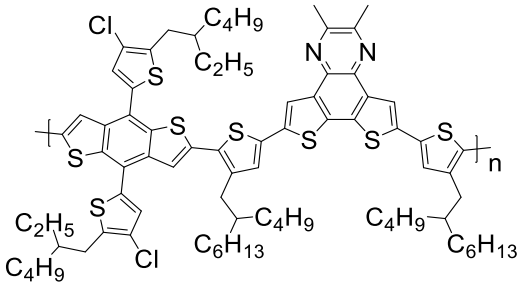
OPV DONORS 更多聚合物结构均可定制合成

D013 | PQM-Cl

Reference Adv. Mater. 2022, 2205009.

基于 PQM-Cl：PY-IT 的全聚合物太阳能电池实现了 18.0%的 PCE，80.7%的 FF 值。基于 PQM-Cl 的柔性光伏电池 PCE 达到 16.5%。

能级 HOMO =−4.93eV

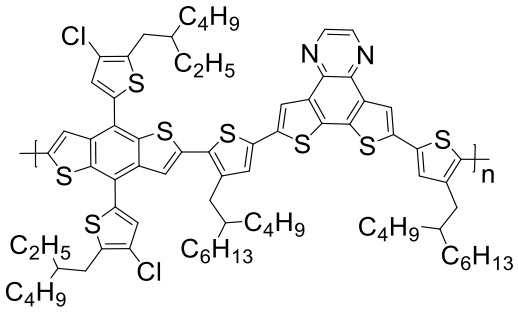


D014 | PBQX-TCl

Reference Adv. Mater. 2023, 35, 2210865.

基于 PBQX-TCl 的单结有机光伏电池实现了 19.51%的高功率转换效率

能级 HOMO = -6.09 eV　LUMO = -3.08 eV

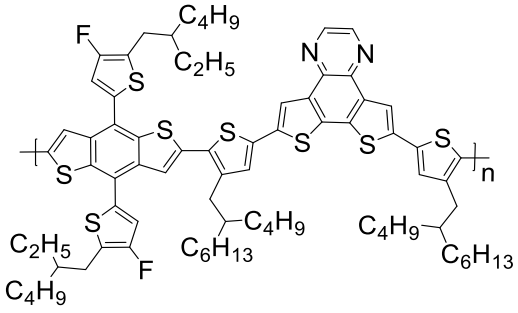


D015 | PBQX-TF

Reference Adv. Mater., 33 (41), 2102420 (2021)

基于PBQx-TF 的三元器件最大 PCE 为 19.0%

能级 HOMO = -5.41 eV, LUMO = -2.82 eV



D016 | PCE10；PTB7-Th

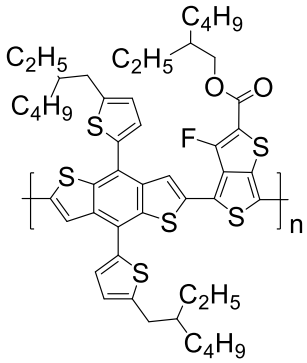
Reference Adv. Mater. 2013, 25, 4766.

2013 年，基于PTB7-Th 的器件获得了 9.35%的效率。目前 PTB7-Th 也被应用于制备有机光电探测器（OPD）。

CAS 1469791-66-9

能级 HOMO = 5.24 eV, LUMO = 3.66 eV

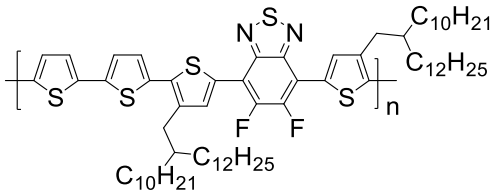
Solubility Chlorobenzene, dichlorobenzene



D017 | FBT-Th4

Reference Adv. Mater. 2014, 26, 2586.

能级 Eg = 1.62 eV,　HOMO = –5.36 eV



D018 | PTQ10

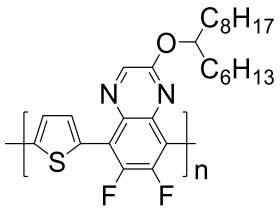
Sci China Chem., 63: 265–271 (2020)

Reference 基于 PTQ10：Y6 的有机太阳能电池功率转换效率为 16.53%。

CAS 2270233-86-6

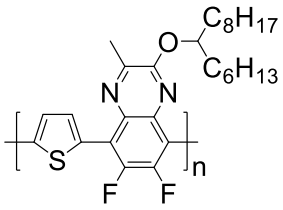
UV 450 to 620 nm (in CHCl3 and film)

能级 HOMO = -5.52 eV, LUMO = -2.76 eV

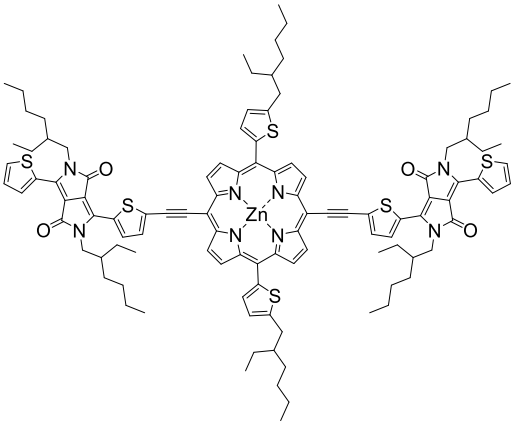


OPV DONORS 更多聚合物结构均可定制合成

D019	PTQ11
Reference	Adv. Mater., 31, 1905480 (2019) 与 PTQ10 相比，PTQ11 表现出更强的分子结晶倾向和更好的空穴传输能力。
能级	HOMO = -5.52 eV, LUMO = -2.76 eV



D020	DPPEZnP-TEH
Reference	J. Am. Chem. Soc. 2015, 137, 7282.
CAS	1797409-92-7

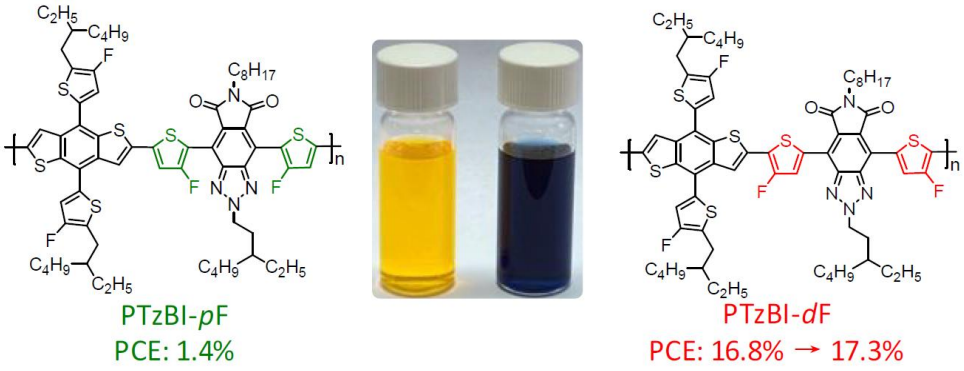


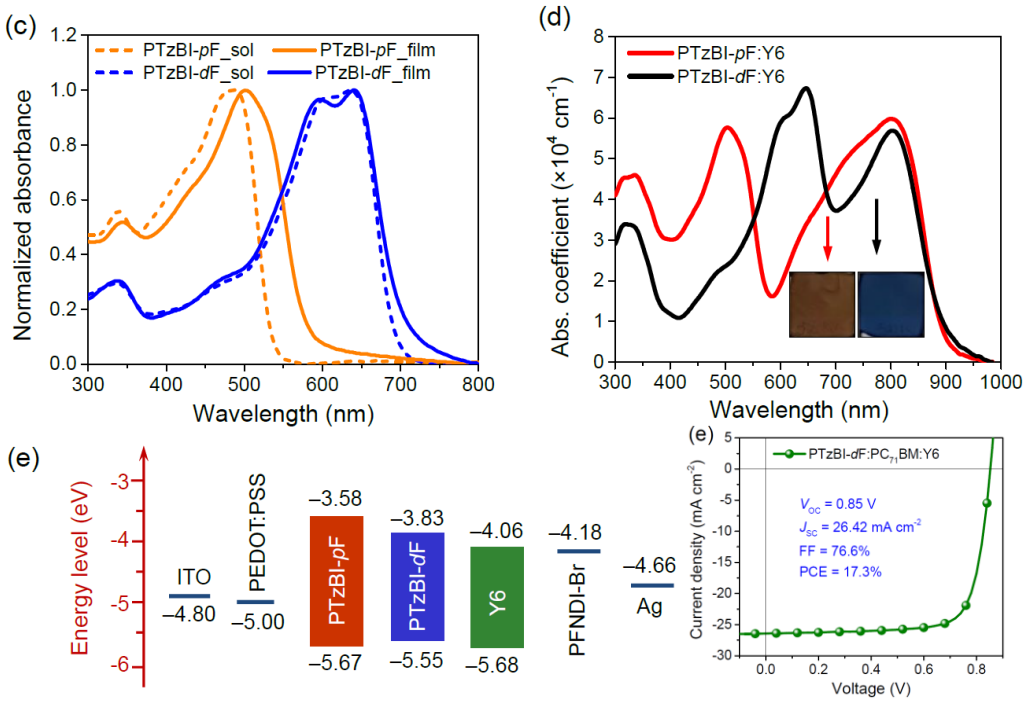
OPV DONORS 更多聚合物结构均可定制合成

■ TzBI 系列聚合物！高效率给体 PTzBI-dF

2020 年，华南理工大学黄飞/应磊教授团队通过调整 TzBI 聚合物上的氟取代基位置合成了新型高效率聚合物给体 PTzBI-dF，基于 PTzBI-dF：Y6：PC71BM 的有机太阳能电池器件表现出高达 17.3%的 PCE。

2023 年，基于活性层 PTzBI-dF:L8BO:Y6 的器件实现了 18.26%的能量转换效率和杰出的热稳定性。于 85 ℃连续加热 1400 小时后，仍可以保持近 95%的初始性能。





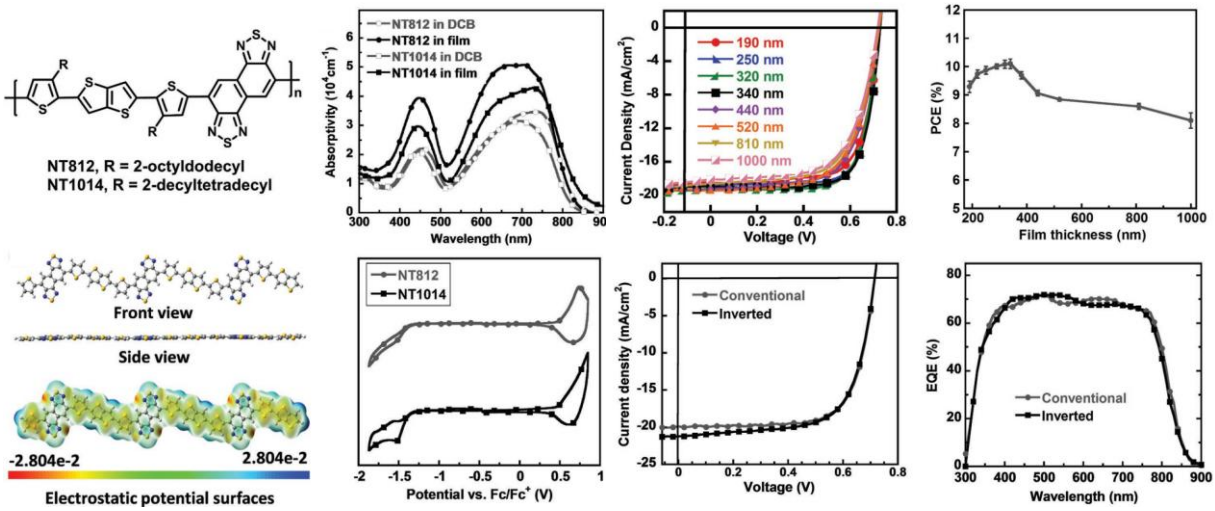
Literature and Reviews

1. Tailoring Regioisomeric Structures of π-Conjugated Polymers Containing Monofluorinated π-Bridges for Highly Efficient Polymer Solar Cells. ACS Energy Lett. 2020, 5, 6, 2087–2094. https://doi.org/10.1021/acsenergylett.0c00939
2. Enabling High Efficiency of Hydrocarbon-Solvent Processed Organic Solar Cells through Balanced Charge Generation and Non-Radiative Loss. Adv. Energy Mater. 2021, 11, 2101768. https://doi.org/10.1002/aenm.202101768
3. Mastering morphology of non-fullerene acceptors towards long-term stable organic solar cells. Nat Commun 14, 2688 (2023). https://doi.org/10.1038/s41467-023-38306-x

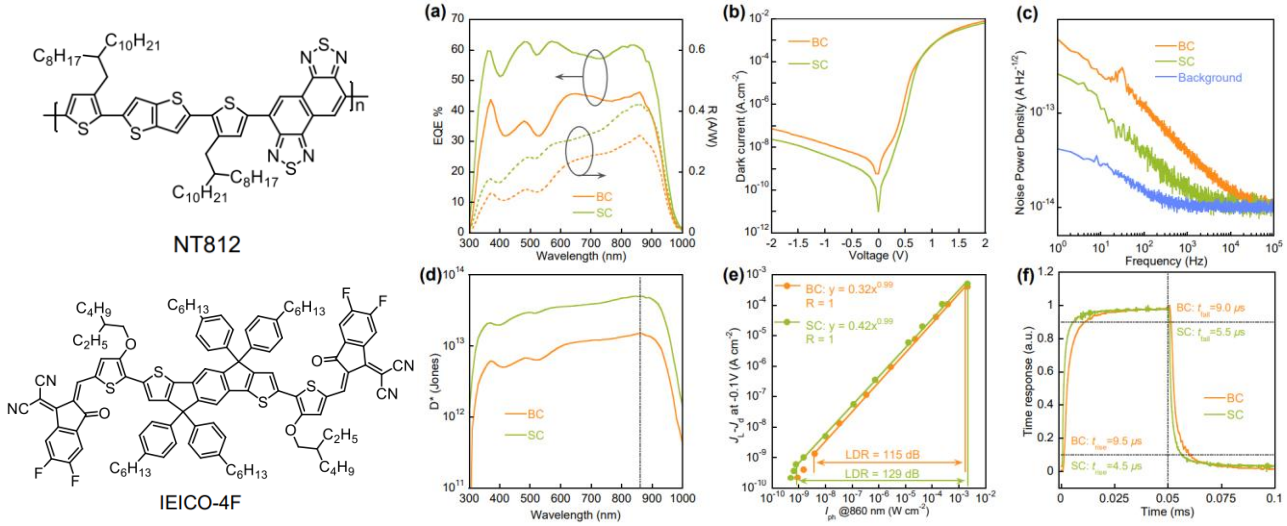
OPV DONORS 更多聚合物结构均可定制合成

■ 高效厚膜 OPV 给体/有机光探测器材料 NT812

2016 年，华南理工大学黄飞/应磊教授团队报道了 NT812 聚合物材料。基于 NT812 的光伏器件，在活性层厚度约 300 nm 时，光电转换效率都达到 10%以上；并且当活性层厚度达到 1μm 时，器件依然维持在 8%以上的光电转换效率。



2022 年，华南理工大学黄飞/应磊教授团队与上海交通大学刘烽教授组、美国劳伦斯伯克利国家实验室王诚博士等合作，通过逐层加工制备基于 NT812:IEICO-4F 的高效有机光探测器。该器件实现高外量子转化效率和低的暗/噪声电流。在-0.1 V 下，器件在 860 nm 表现出最大比探测率为 5×10^{13} Jones，这是可见光-近红外 OPD 的最高比探测率之一。



Literature and Reviews

1. A Novel Naphtho[1,2-c:5,6-c']Bis([1,2,5]Thiadiazole)-Based Narrow-Bandgap π-Conjugated Polymer with Power Conversion Efficiency Over 10%. Adv. Mater., 28: 9811-9818. https://doi.org/10.1002/adma.201603178
2. High-performance organic photodetectors enabled by a refined fibrillar multiphase morphology, Chemical Engineering Journal,Volume 452, Part 2,2023,139295. https://doi.org/10.1016/j.cej.2022.139295.

有机光伏受体

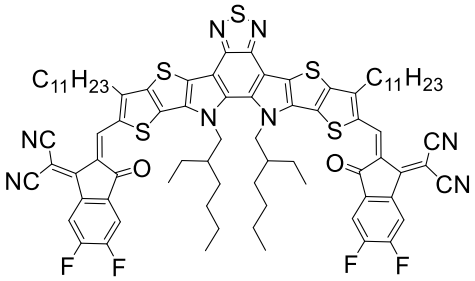
伏安光电提供的小分子受体材料纯度高，品质好，器件性能经多所高校及研究机构验证，L8-BO：PM6 器件 PCE 值最高接近 19%。

A001 | Y6

Reference Joule 2019, 3, 1140.

非富勒烯明星受体材料。2019 年，PM6：Y6 器件效率达到了 15.7%。2020 年，D18：Y6 器件效率突破 18%

CAS 2304444-49-1

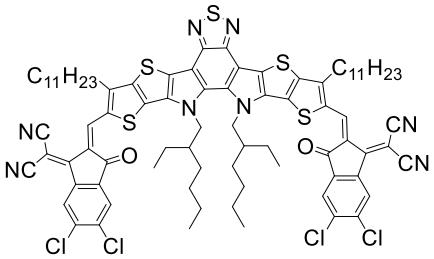


A002 | Y7；BTP-4Cl

Reference Nat. Commun. 2019, 10, 2515

相比 Y6，BTP-4Cl 的 LUMO 能级稍低，但是器件电压损失更小，VOC 反而略高，基于 PM6：BTP-Cl 器件 PCE 达到了 16.5%

CAS 2447642-40-0

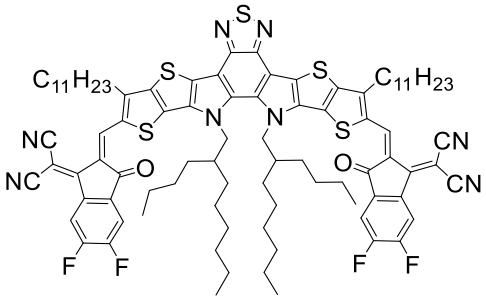


A003 | Y6-BO

Reference Adv. Mater. 2019, 31, 1903441.

与 Y6 相比，Y6-BO 具有更高的溶解度

CAS 2389125-23-7

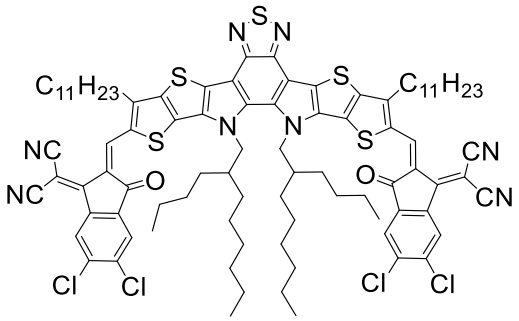


A004 | BTP-BO-4Cl; BTP-4Cl-12

Reference Natl. Sci. Rev., 7, 1239–1246 (2020)

为提高 BTP-4Cl 的加工性能，用 2-丁基辛基取代了 2-乙基己基，溶解度更好。基于 PM6:BTP-4Cl-12 的器件 PCE 达到了 17%

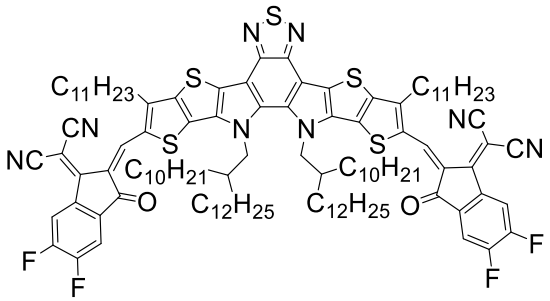
CAS 2414918-25-3



A005 | Y6-DT;DTY6

Reference Joule 4 (9), 2004-2016 (2020)

具有两条大的癸基十二烷基侧链的DTY6是为大面积有机太阳能电池开发的。基于 PM6：DTY6 的在无卤溶剂邻二甲苯中加工的有机太阳能电池，，实现了 16.1%的功率转换效率

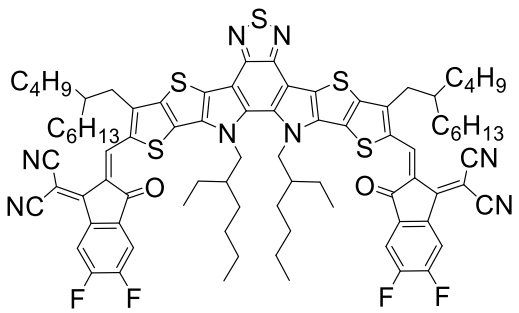


A006 | L8-BO

Reference Nat Energy 6, 605–613 (2021).

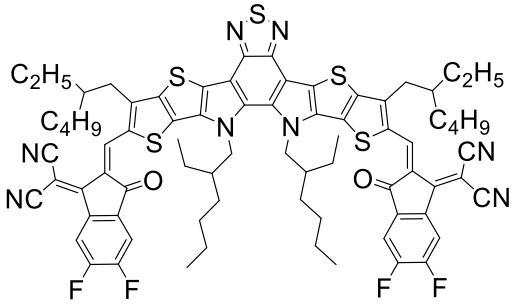
基于 L8-BO 的单结有机太阳能电池实现了前所未有的 18.32%（认证值为 17.9%）的效率。伏安光电提供优质经验证的 L8-BO

CAS 2668341-40-8



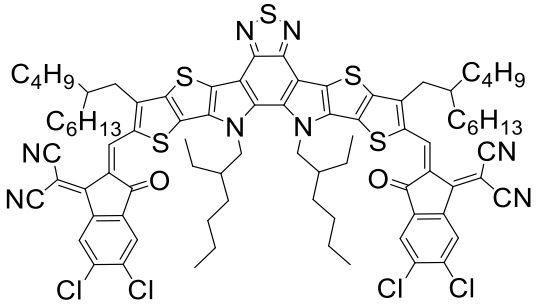
A007 | L8-EH

Reference Nat Energy 6, 605–613 (2021).



A008 | LC-333

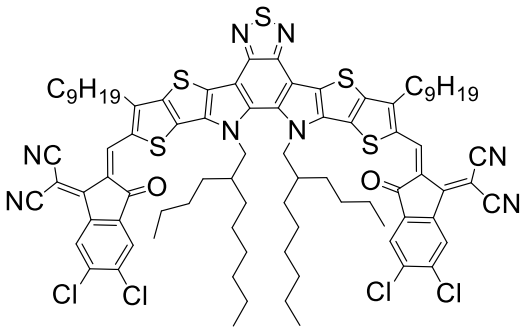
Reference Nat Energy 6, 605–613 (2021).



A009 | BTP-eC9

Reference Adv. Mater. 2020, 32, 1908205.

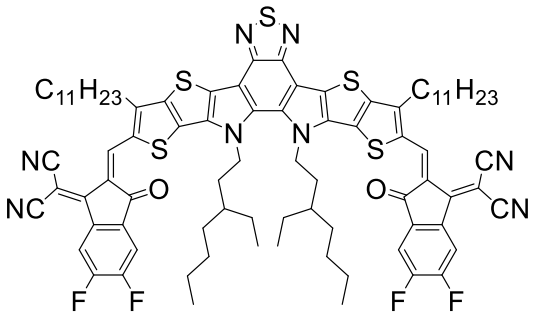
CAS 2598965-39-8



A010 | N3

Reference Joule, 3 (12); 3020-3033 (2019)

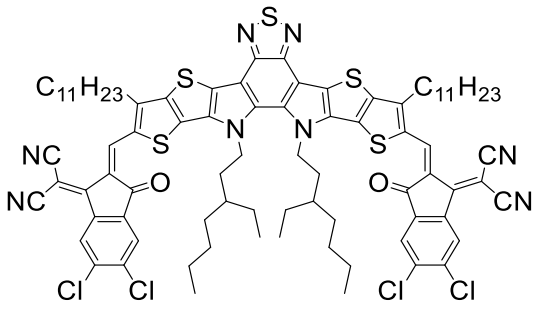
CAS 2640657-07-2



A011 | N3-4Cl

Reference Mater. Chem. Front., 2020,4, 2428

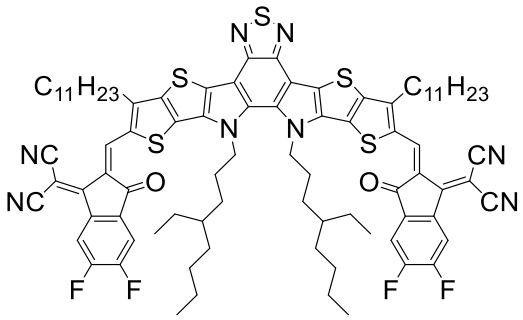
CAS 2758987-27-6



A012 | N4; BTIC-4EO-4F

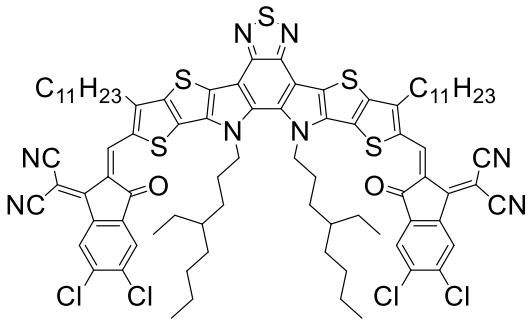
Reference ACS Appl. Mater. Interfaces 2021, 13, 5, 6147–6155

CAS 2640657-07-2

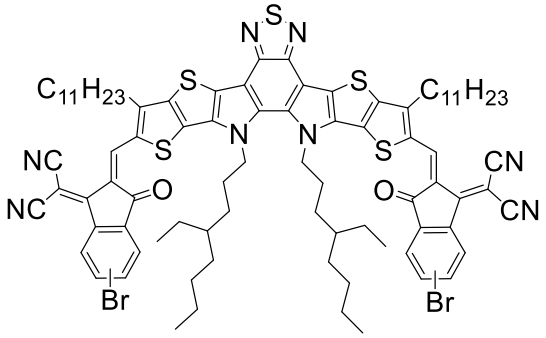


A013 | N4-4Cl; BTIC-4EO-4Cl

Reference ACS Appl. Mater. Interfaces 2021, 13, 5, 6147–6155



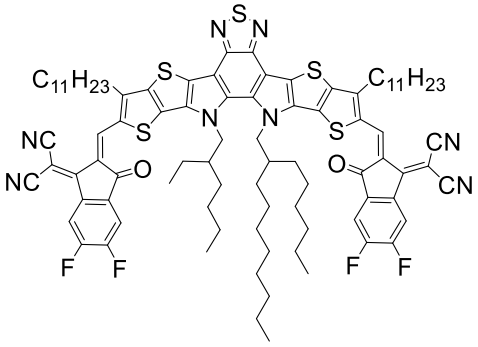
A014 | N4-2Br;



A015 | EH-HD-4F

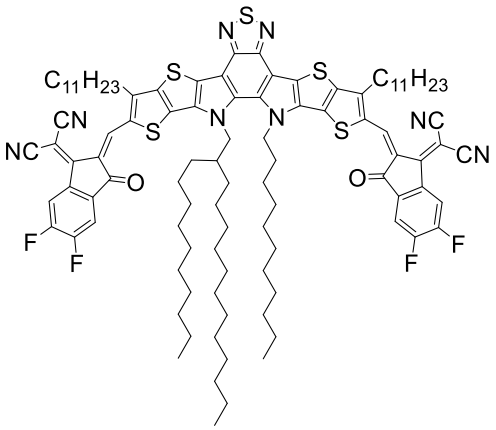
Reference Sci. China Chem. 64, 1192–1199 (2021)

适当的不对称侧链可以诱导更有利的正面分子取向，增强载流子迁移率，平衡电荷传输并减少重组损失。基于 PM6: EH-HD-4F 的太阳能电池器件 PCE 值达到了 18.38%。



A016 | DTC11

Reference 基于 DTC11 的有机光伏器件效率达到 19%

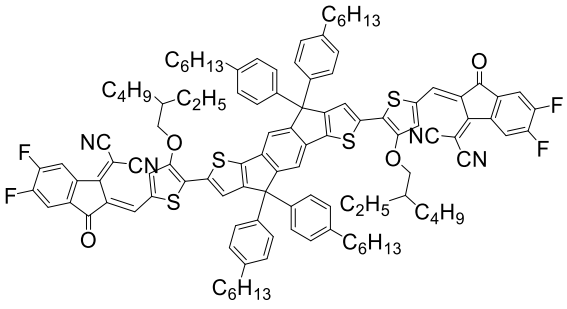


A017 | IEICO-4F

Reference Chemical Engineering Journal 452 (2023) 139295

基于 PTB7-Th：IEICO-4F 的有机太阳能电池效率超过 10%。IEICO-4F 同时用于制备有机光电探测器（OPD），基于 NT812：IEICO-4F 制备的 OPD 器件在-0.1V 下，860nm 表现出最大比探测率 5.0 × 10^{13} Jones。这是可见光-近红外 OPD 的最高比探测率之一。

CAS 2089044-02-8

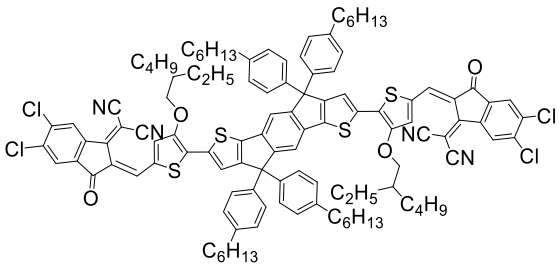


A018 | IEICO-4Cl

Reference Adv. Mater., 29 (43), 1703080 (2017)

HOMO = -5.56 eV， LUMO = -4.23 eV

CAS 2240998-88-1

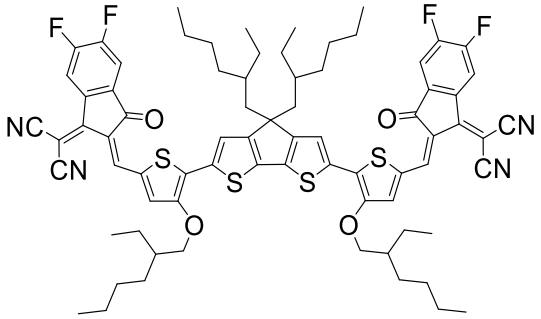


A019 | COTIC-4F

Reference Adv. Energy Mater., 2018, 8 (24), 1801212

COTIC-4F 吸收从 700 nm 扩展到近红外范围（约 1100 nm），光学带隙为~1.1 eV。可用作近红外（NIR）响应有机太阳能电池和有机光电探测器

CAS 2455510-64-0

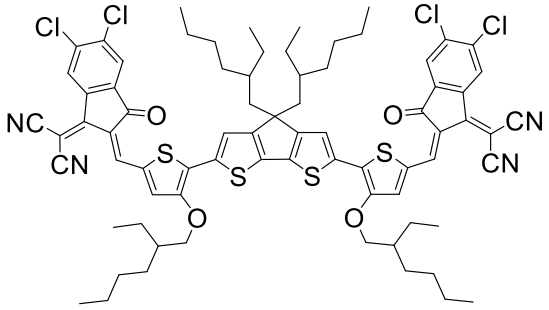


A020 | COTIC-4Cl

Reference Sci. China Mater., 2021.64(10): 2430

COTIC-4Cl 薄膜具有延伸到近红外（NIR）的吸收，范围从 600 到约 1400nm。光学带隙为~1.0 eV

CAS 2328092-51-7

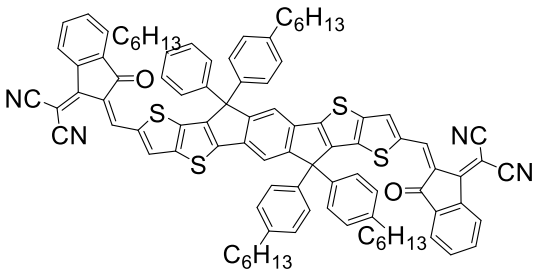


A021 | ITIC

Reference Adv. Mater. 2015, 27, 1170.

HOMO = -5.48 eV， LUMO = -3.83 eV

CAS 1664293-06-4

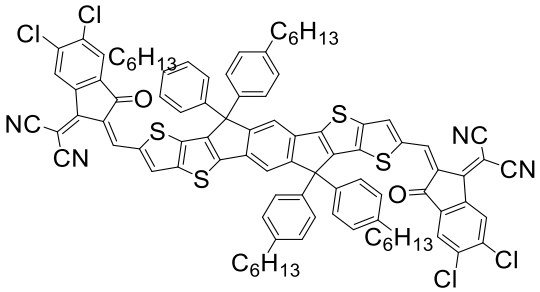


A022 | ITIC-4Cl

Reference Adv. Mater. 2018, 30, 1800613.

HOMO = -5.75 eV， LUMO = -4.09 eV

CAS 2253663-81-7

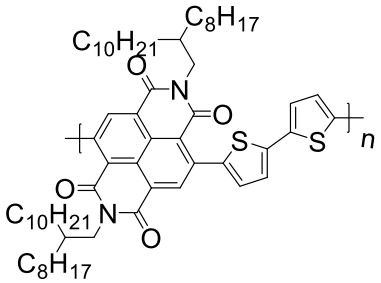


A023 | N2200；P(NDI2OD-T2)

Reference J. Am. Chem. Soc. 2009, 131, 8.

HOMO = -5.77 eV， LUMO = -3.84 eV

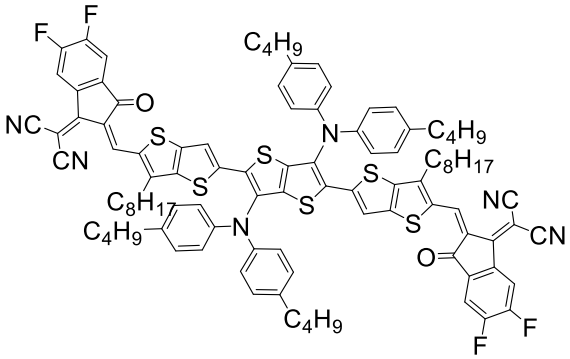
CAS 1100243-40-0



A024 | 2Bth-2F 非稠环受体材料

Reference Adv. Energy Mater. 2021, 11, 2102591

HOMO=-5.55 eV，LUMO=3.98 eV



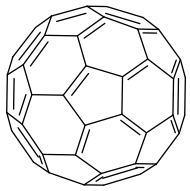
富勒烯材料

有机太阳能电池发展的早中期，以PC61BM和PC71BM为代表的富勒烯及其衍生物，由于其高的电子亲和势、各向同性的电子传输能力和高的电子迁移率，在电子受体材料中占据了统治地位。这一时期通常被称为富勒烯时代，伏安光电为您提供高纯度的通用富勒烯材料。

A025 | C60；Fullerene

CAS 131159-39-2

Grade 99.9%



A026 | PC61BM

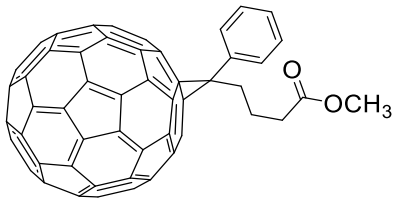
[6,6]-Phenyl C61 butyric acid methyl ester

Reference Science, 258 (1992), 1474–1476

HOMO = -6.1 eV， LUMO = -3.7 eV

CAS 160848-22-6

Grade > 99%



A027 | PC71BM

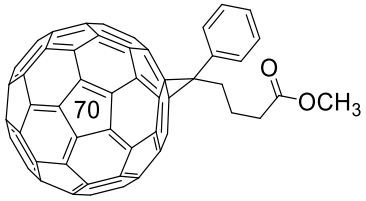
[6,6]-Phenyl-C71-butyric acid methyl ester

Reference Sol. Energy Mater. Sol. Cells, 97 (2012)

HOMO = -5.9 eV, LUMO = -3.9 eV

CAS 609771-63-3

Grade > 99%



中间体材料

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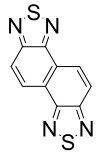	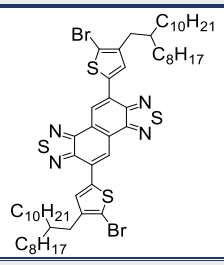	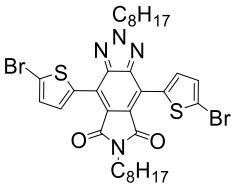	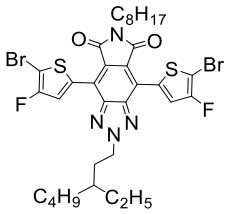	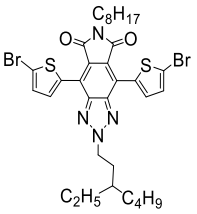
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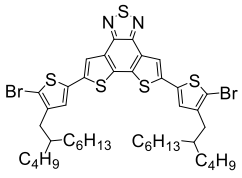	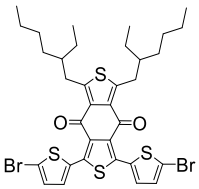	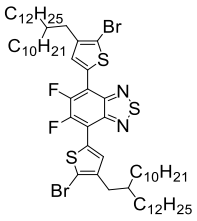	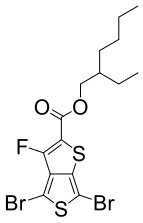	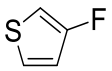

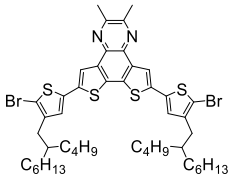

QM-2Br

Reference：Adv. Mater. 2022, 2205009. DOI: 10.1002/adma.202205009.

该单元可用于合成聚合物给体材料 PQM-Cl，利用 PQM-Cl 制备的全聚合物太阳能电池器件可达到 18%的效率。

Active layer	V_{OC} [V]	J_{SC} [mA cm^{-2}]	FF [%][a]	PCE [%][a]
PBDB-TF:PY-IT[b]	0.936	22.8	74.1 (74.0 ± 0.4)	15.8 (15.5 ± 0.2)
PQM-Cl:PY-IT[b]	0.920	24.3	80.7 (79.1 ± 0.2)	18.0 (17.6 ± 0.2)
PBDB-TF:PY-IT[c]	0.935	22.7	67.5 (67.1 ± 0.8)	14.3 (14.1 ± 0.2)
PQM-Cl:PY-IT[c]	0.918	24.1	74.8 (74.2 ± 0.3)	16.5 (16.2 ± 0.2)

[a]The average PCE values with standard deviations were obtained from 5 individual devices; [b]Rigid devices; [c]Flexible devices.

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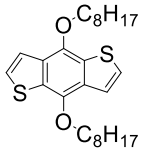	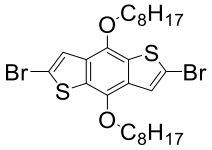	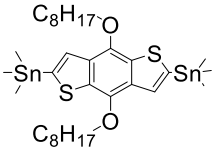	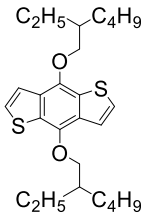	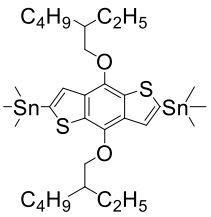
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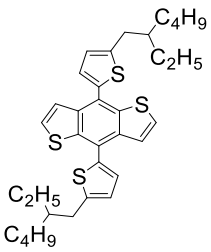	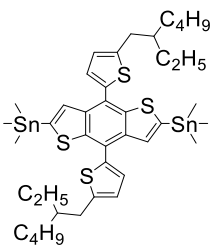	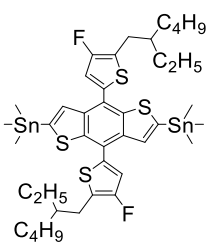	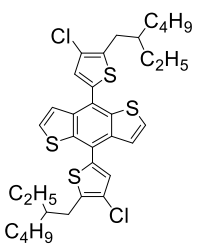	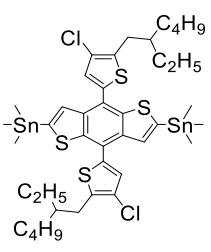
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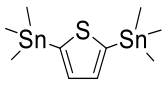	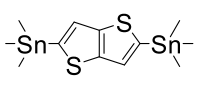	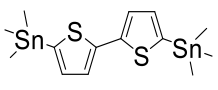	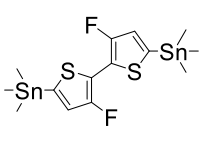	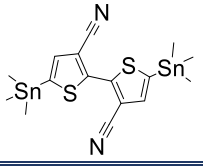

INTERMEDIATE MATERIALS 中间体材料

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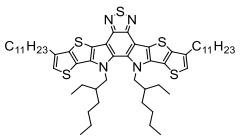	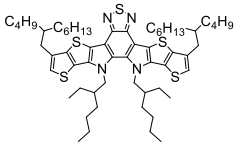	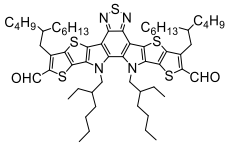	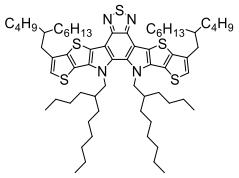	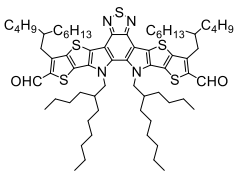
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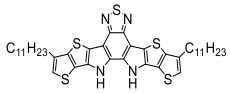	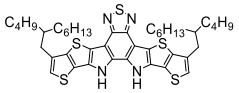	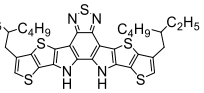	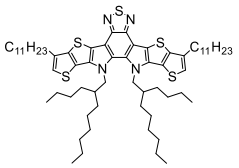	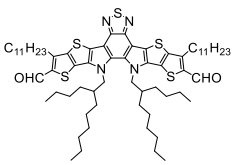
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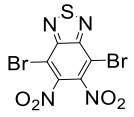	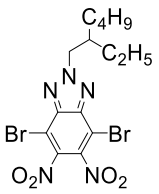	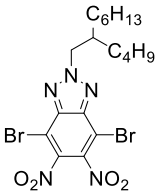	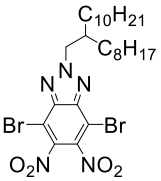	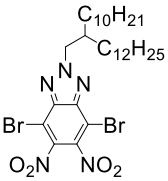
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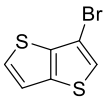	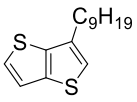	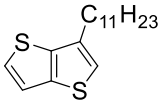	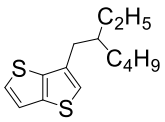	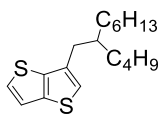
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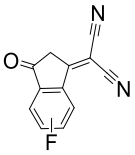	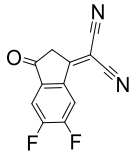	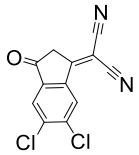	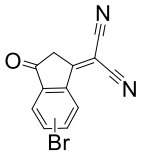	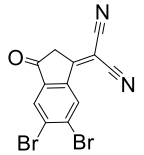
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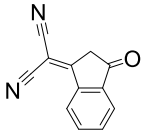	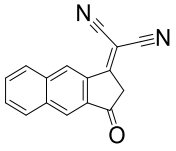	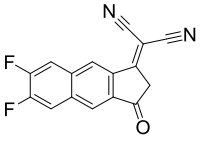	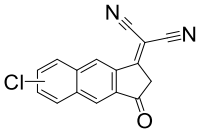	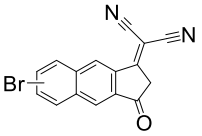
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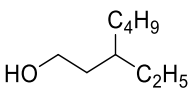	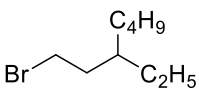	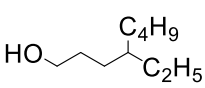	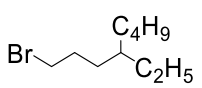	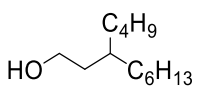
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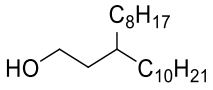	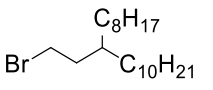	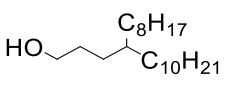	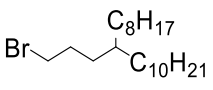	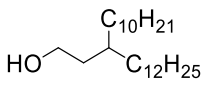
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INTERMEDIATE MATERIALS 中间体材料

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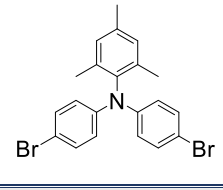	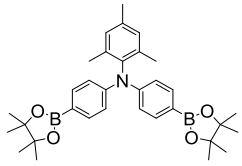	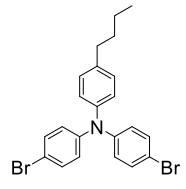	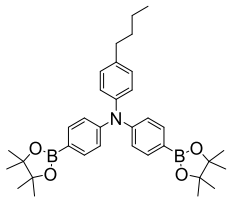	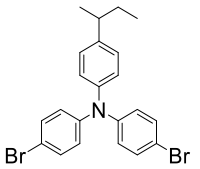
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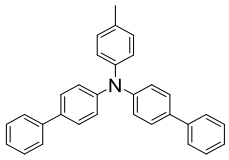	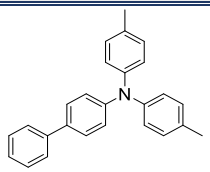	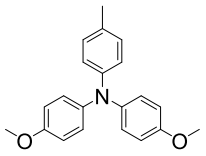	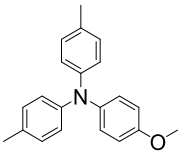	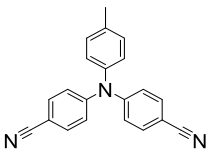
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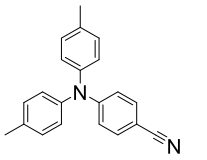	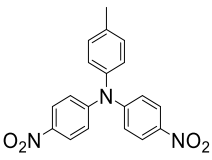	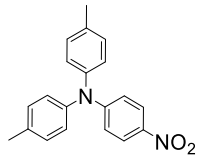	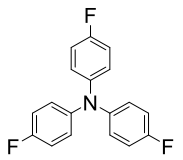	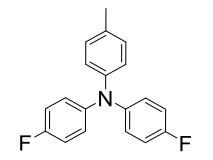
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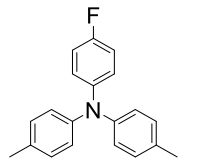	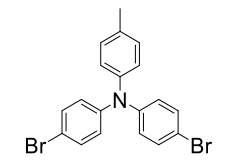	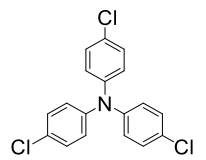	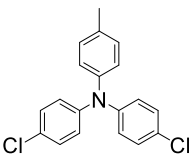	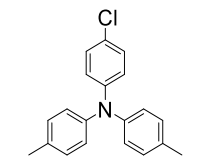
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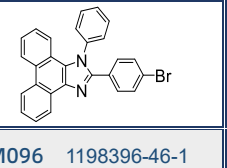	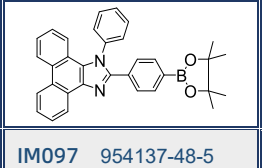	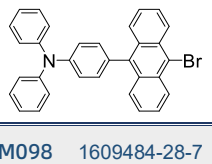	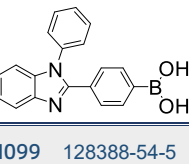	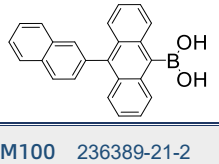
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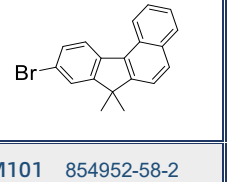	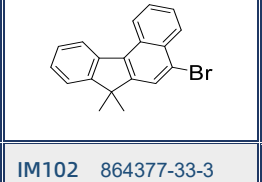	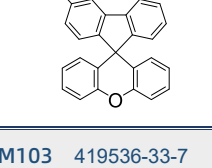	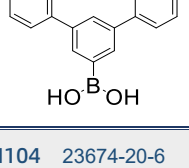	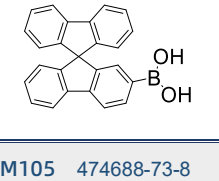
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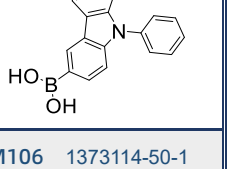	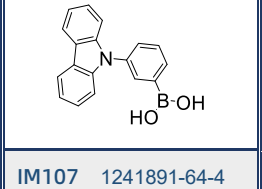	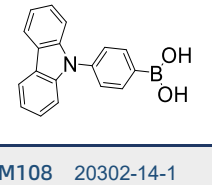	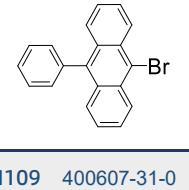	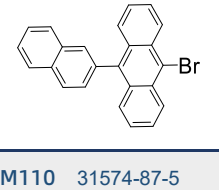
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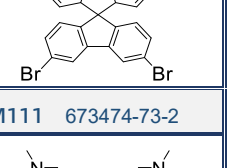	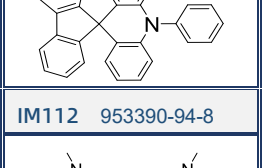	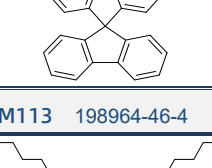	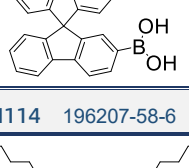	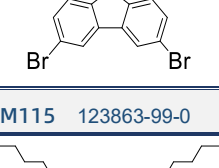
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