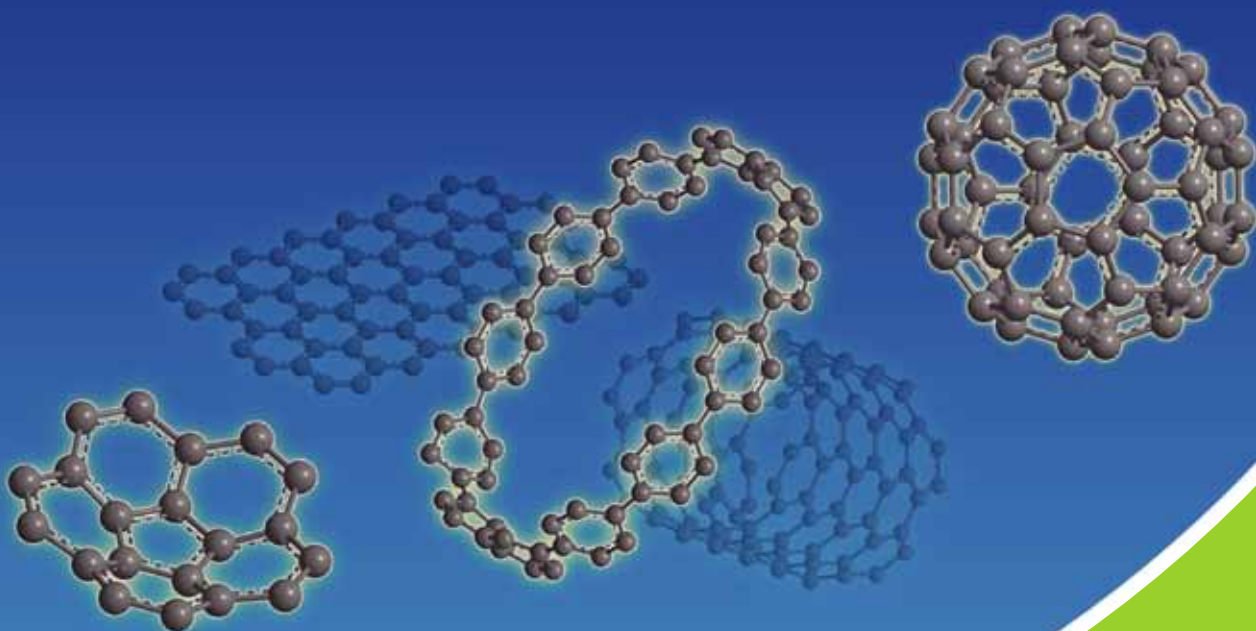


碳纳米材料

Nanocarbon Materials



富勒烯

碳纳米管(CNTs)

石墨烯/石墨烯氧化物(GOs)

纳米金刚石(NDSs)

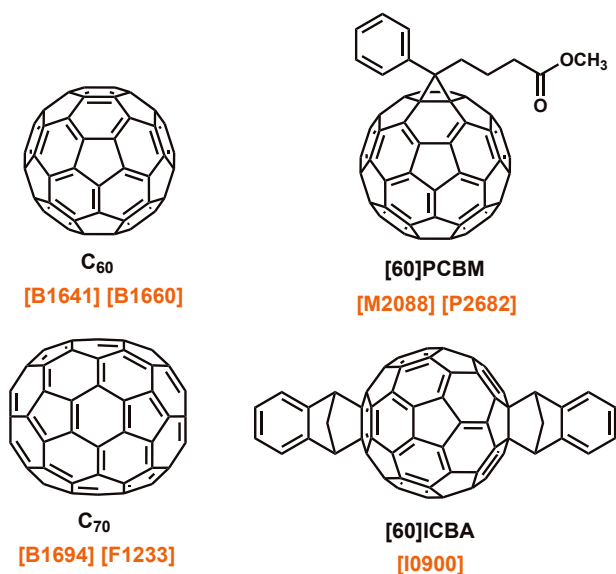
纳米碳单元结构

碳纳米材料

1. 富勒烯

富勒烯是一种球状的碳化合物，和钻石、石墨、碳纳米管一样，它也是碳的一种同素异形体。富勒烯在单一分子构成的物种中，是可被单独分离出的碳化合物， C_{60} 、 C_{70} 以及 C_{84} 等是较为常见的此类化合物。其中， C_{60} 比较具有代表性。Kroto, Smalley和Curl等人首次观察到了 C_{60} 的结构，其由60个碳原子构成的12个五元环和20个六元环组成¹⁾。Kroto, Smalley和Curl也因此共同获得了1996年的诺贝尔化学奖。此外，在富勒烯被首次发现之前，Osawa于1970年就预言了富勒烯的存在²⁾。

富勒烯的最独特之处在于它是一种卓越电子受体。富勒烯具有n型半导体的特性，作为电子载体的有机电子材料被广泛应用于各种研究中。铷掺杂和铯掺杂的富勒烯电子载体还可用作超导体，在30 K以上发生超导转变^{3,4)}。



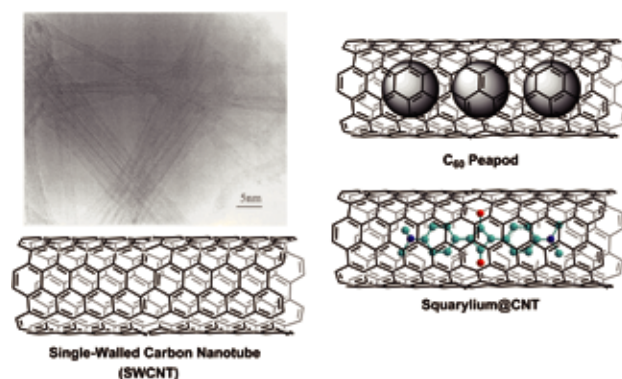
对富勒烯进行加成反应或其它化学修饰易于制备出相应的富勒烯衍生物。这些衍生物也都是分子组成，因此可以进行精确的结构分析。与其它纳米材料类似，未经修饰的富勒烯溶解性较差。然而，通过引入溶解性高的官能团，可以制备出可溶液加工的电子材料。比如，苯基- C_{61} -丁酸甲酯([60]PCBM(M2088))和蒽- C_{60} 二加合物([60]ICBA(I0900))在制造可溶液加工的电子器件方面，都是有效的有机半导体^{5,6)}。这些富勒烯衍生物是n型有机半导体，与p型共轭聚合物混合后，可以用来制造有机太阳能电池(OPV)⁷⁾。另外，富勒烯衍生物在有机晶体管中的应用也被报道过⁸⁾。 C_{60} 与

四(二甲氨基)乙烯(TDAE)络合可以制备出一种电荷转移复合物(TDAE- C_{60})，它在低温下可成为一种有机磁体⁹⁾。

2. 碳纳米管

碳纳米管(CNT)是一种直径为纳米级的圆柱形结构，可以看做是由石墨烯层卷曲而成。Iijima于1991年首次观察到了CNT¹⁰⁾。由 sp^2 碳原子构成的CNT与富勒烯类似。根据长度、直径、手性以及层数的不同，CNT可分为多种类型。这些结构的不同也决定了CNT有不同的能带结构、金属特性以及半导体性能^{11,12)}。由于碳层的卷曲是随机的，在一般的合成过程中，往往得到的是2/3半导体型CNT和1/3金属型CNT的混合物。为了利用CNT的半导体性能，需要纯的半导体型CNT，因此优化的合成策略和有效的纯化方法都有待进一步研究¹³⁻¹⁵⁾。

由于CNT的柱形结构，使其内部能够填充纳米级的分子和原子。例如，富勒烯填充的CNT，俗称“peapod(豆荚)”¹⁶⁾。此外，CNT还可以填充金属、水，以及分子氧等，填充在CNT中的物质具有与外界相比不同的性质^{17,18)}。另外，有机染料(比如方酸菁)也易于以溶液的形式被包裹在CNT内部。在这种情况下，方酸菁吸收光，然后能量转移(敏化作用)至CNT外层¹⁹⁾。利用CNT储存氢气也有望用于燃料电池的开发²⁰⁾。



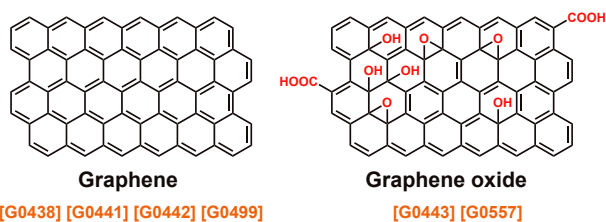
3. 石墨烯/氧化石墨烯

石墨烯也是一种纳米碳材料，它是二维薄层结构，由 sp^2 碳原子构成的六元环紧密堆积而成。石墨烯的发现由来已久，石墨即是石墨烯以范德华力连接而成。但是，由于很长一段时期都没能找到将石墨烯从石墨中分离出来的方法，因此其性质直至近

些年才被研究清楚。2004年, Geim和Novoselov等人用一种非常简单的方法分离出了薄片石墨烯。他们用胶带从高定向热解石墨(HOPG)中剥离出一层石墨烯, 然后将其粘在基片上。此后, 石墨烯独特的电子特性, 机械性能和化学性质陆续被揭开²¹⁾。Geim和Novoselov也因此共同获得了2010年的诺贝尔物理学奖。

石墨烯最显著的特点在于其电子性能。石墨烯的电子迁移率比硅高100倍²²⁾。因此, 可利用石墨烯开发高迁移率、低功耗的晶体管。石墨烯也有望成为下一代用于LSI(大规模集成电路)的通道材料。此外, 石墨烯的机械强度比铁强100倍。其耐受电流密度也大大优于铜, 因此可以用作传输大电流的电线材料²³⁾。

石墨烯中的电子表现为无质量的狄拉克费米子, 类似于中微子²⁴⁾, 并且在室温下具有量子霍尔效应²⁵⁾。石墨烯的自旋轨道相互作用很小, 并且碳原子的核磁矩几乎可以忽略, 因此是一种理想的自旋电子材料。目前已开发出石墨烯和一种铁磁材料的杂化技术, 可应用在基于电子自旋的信息处理器(自旋电子器件)上²⁶⁾。

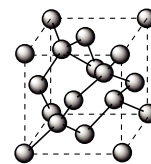


石墨烯的制备方法包括HOPG剥离法, 化学气相沉积(CVD)法²⁷⁾, 以及氧化石墨烯(GO)还原法²⁸⁾。对于GO还原法, 制备GO的方法很多, 其性能和应用取决于氧化程度。GO的石墨烯单片上通常包含羟基、环氧基和羧基等官能团, 因此可以分散在水和其它极性溶剂中。也正因为如此, GO薄膜可以通过溶液处理在基片上制备。GO被还原后可以得到还原后的氧化石墨烯(rGO), 但这并不是完美的石墨烯。rGO中含有一些氧成分, 其石墨烯结构上也有缺陷。GO中存在sp³碳原子, 因此是绝缘体, 但rGO是导电的, 因此可用于电极材料。GO的水溶液分散体系可以用作润滑剂, 以降低金属表面的摩擦力²⁹⁾。GO负载的金属催化剂也被开发出来, 用于交叉偶联反应和加氢反应^{30,31)}。由于含氧官能团的存在, 也可以在GO上引入其它一些官能团。这些GO衍生物或许可用于发光材料和生物传感器^{32,33)}。

4. 纳米金刚石

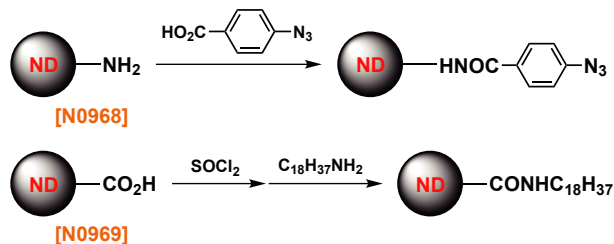
金刚石, 碳的一种同素异形体, 有极佳的硬度、摩擦系数、热导率、绝缘性能, 以及折光率。较大的并且纯度高的金刚石是很好的珠宝材料。另

外, 由于金刚石是天然存在的最硬的物质, 因此其主要的工业用途是作为切割和抛光工具。不过, 也正是由于它的硬度, 使得它难以被加工, 因此大的金刚石在工业上的应用有限。纳米金刚石(ND)是一种具有金刚石晶体结构的纳米颗粒, 拥有普通金刚石的卓越性能。ND来源于人工合成, 可用于抛光工具和机器润滑油的添加剂。



Nanodiamond (ND)

通过引入羧基和氨基官能团可以对ND表面进行修饰。这些官能团又可以通过化学修饰进一步转变, 从而使ND粒子功能化³⁴⁻³⁶⁾。未经修饰的ND可以分散在水中, 但在有机溶剂中会凝聚。而经过烷基官能团修饰的功能化ND粒子则可以分散在有机溶剂中。另外, 也可以用ND修饰玻璃表面, 即利用硅烷偶联剂进行功能化³⁷⁾。



因为ND在体内无害, 它的应用也被扩展到生物和医学领域^{38,39)}。由于结晶中N原子(N)和空位(V)存在复合缺陷(NV), 金刚石能显现出荧光⁴⁰⁾, 因此可以用作荧光标记试剂, 用于在显微镜下监测生物分子的运动和结构变化⁴¹⁻⁴³⁾。由于ND化学稳定性好, 可以在复杂的体内环境中很容易的检测到荧光行为。也有报道描述了没有NV缺陷的ND在功能化后也能显示出荧光性⁴⁴⁾。蛋白质或生物素负载的ND, 被报道用于提高对生物分子的亲和性^{45,46)}。这些经过修饰的NDs预期可用于药物传输体系。

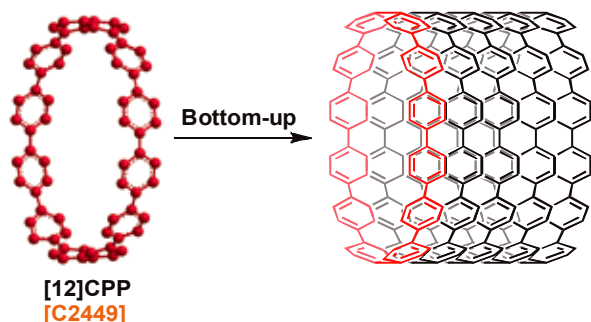
5. 碳纳米单元结构

环对苯撑 (CPP)

碳纳米管(CNT)涵盖了高等化学, 材料科学, 生命科学, 以及其它研究领域。制备CNTs可以利用物理方法, 比如电弧放电法, 激光烧蚀法, 以及化学气相沉积法。不过, 这些物理方法存在一个缺陷, 其制备出的CNTs具有多种直径, 尺寸大小不一。

环对苯撑(CPP), 俗称碳纳米环, 由对位取代的

苯环相互连接形成环状结构。CPP是构成碳纳米管(CNT)的单元结构,因此吸引了基础化学和材料科学领域的众多研究者。Itami等人利用CPP作为模板化合物,通过自下而上的方法,成功地合成出了大小一致的CNTs⁴⁷⁾。

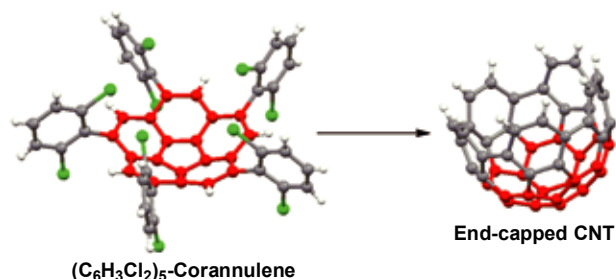


最近,合成具有较大形变而直径更小的CPP上。Yamago⁴⁸⁾和Jasti⁴⁹⁾课题组分别报道了[5]CPP的合成,这是迄今为止最小的CPP。鉴于此,利用[5]CPP也有望合成出最小直径的CNTs。另外,由于[5]CPP是构成C₆₀富勒烯的单元结构,因此其电子特性和物理特性也非常令人关注。特定直径的CPP还可以和富勒烯形成一种包合物⁵⁰⁾。

心环烯和三聚茛

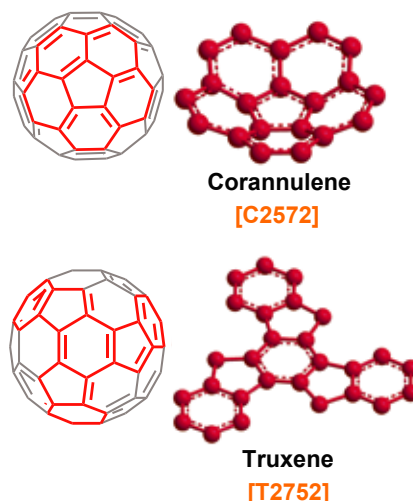
心环烯,俗称[5]circulene,是一种多环芳香化合物,其结构由五个苯环组成。心环烯于1960年被首次合成⁵¹⁾,之后其碗状结构被发现⁵²⁾。作为一种纳米碳材料,心环烯备受关注,因为它也是C₆₀富勒烯的一种单元结构。

Scott等人利用心环烯作为起始原料,通过闪式真空热裂解(FVP)合成出了一种聚芳烃化合物。这种聚芳烃化合物相当于封端的CNT。将此类封端CNT进行扩展,则可以制备出常规的CNT⁵³⁾。Itami和Scott等人还利用心环烯合成出了一种强烈扭曲的纳米石墨烯⁵⁴⁾。



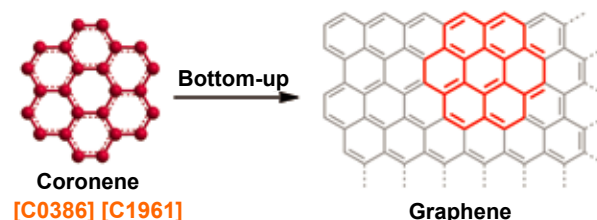
三聚茛拥有星状的刚性平面结构,它也是C₆₀富勒烯的一种单元结构。三聚茛衍生物易于形成无定形结构⁵⁵⁾,因此可以用作OLED的原材料。另外,以三聚茛作为起始反应物也可以合成出C₆₀富勒烯。Otero等人曾通过三步反应合成出了一种分子式为C₆₀H₃₀的聚芳烃化合物,在铂金表面对此聚芳烃进行

热处理便得到了C₆₀富勒烯⁵⁶⁾。



晕苯

晕苯,又称[6]circulene,是另外一种多环芳香化合物,其结构由六个苯环组合而成。晕苯是一种纳米级的分子化合物,是典型的纳米石墨烯,比石墨烯小。与石墨烯不同,晕苯具有带隙,因此可以用作有机晶体管材料⁵⁷⁾。另外,还可通过自下而上的策略,用晕苯构建石墨烯纳米结构⁵⁸⁾。Kubozono等人从掺杂碱金属的萘中观察到超导性后⁵⁹⁾,关于多环芳香化合物有机超导体的研究就越来越受到关注^{60,61)}。有报道指出,一种碱金属掺杂的晕苯也呈现出了超导性⁶²⁾。




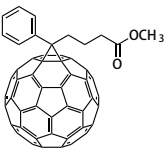
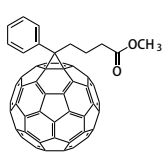
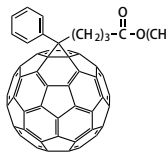
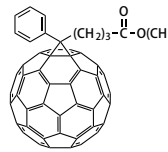
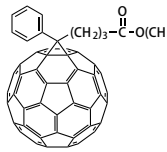
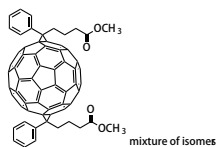
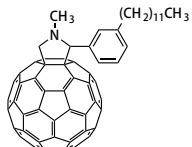
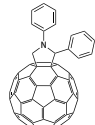
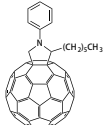
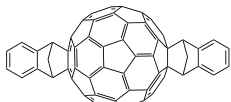


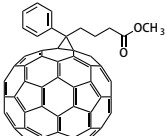
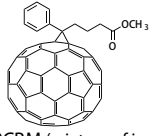


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富勒烯

Fullerenes

富勒烯 Fullerenes				
富勒烯				
B1660 100mg 1g	B1641 100mg 500mg 1g	B1642 100mg 1g		
 Fullerene C ₆₀ CAS RN: 99685-96-8	 Fullerene C ₆₀ (pure) CAS RN: 99685-96-8	 C ₆₀ (contains ca. 20% C ₇₀) CAS RN: 99685-96-8		
M2088 100mg	P2682 100mg	P2013 100mg	P2014 100mg	P2015 100mg
 [60]PCBM CAS RN: 160848-22-6	 [60]PCBM [for organic electronics] CAS RN: 160848-22-6	 PCBB CAS RN: 571177-66-7	 PCBO CAS RN: 571177-68-9	 [60]PCB-C ₁₂ CAS RN: 571177-69-0
B4576 50mg	C2415 100mg	D5757 100mg	P2744 100mg	I0900 50mg
 Bis-PCBM (mixture of isomers) CAS RN: 1048679-01-1	 C ₆₀ MC ₁₂ CAS RN: 403483-19-2	 N,2-Diphenyl[60]fulleropyrrolidine (contains 5% Hexane at maximum) CAS RN: 1373934-14-5	 N-Phenyl-2-hexyl[60]-fulleropyrrolidine CAS RN: 1426332-00-4	 ICBA CAS RN: 1207461-57-1
B1694 100mg	F1233 100mg	M2550 50mg	P2683 100mg	
 Fullerene C ₇₀ CAS RN: 115383-22-7	 Fullerene C ₇₀ [for organic electronics] CAS RN: 115383-22-7	 [70]PCBM (mixture of isomers) CAS RN: 609771-63-3	 [70]PCBM (mixture of isomers) [for organic electronics] CAS RN: 609771-63-3	

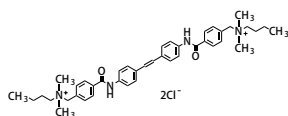
碳纳米管(CNTs)

Carbon Nanotubes (CNTs)

碳纳米管(CNTs) Carbon Nanotubes (CNTs)				
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Carbon Nanotube Multi-walled 20-40nm(diam.), 5-15µm(length) CAS RN: 308068-56-6	Carbon Nanotube Multi-walled 40-60nm(diam.), 1-2µm(length) CAS RN: 308068-56-6	Carbon Nanotube Single-walled (>85%) below 3nm(Average diam.), over 5µm(Average length) CAS RN: 308068-56-6	Carbon Nanotube Multi-walled 10-20nm(diam.), 5-15µm(length) CAS RN: 308068-56-6	Carbon Nanotube Multi-walled 20-40nm(diam.), 1-2µm(length) CAS RN: 308068-56-6
C2156 1g 5g	CNT Dispersant			
Carbon Nanotube Multi-walled 40-60nm(diam.), 5-15µm(length) CAS RN: 308068-56-6				
C2158 1g 5g				
Carbon Nanotube Multi-walled 60-100nm(diam.), 5-15µm(length) CAS RN: 308068-56-6				

E1127

1g



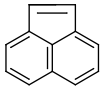
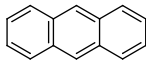
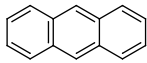
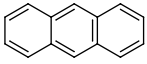
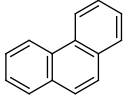
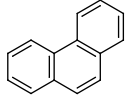
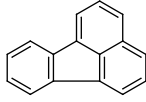
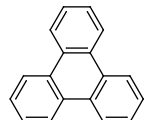
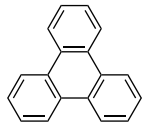
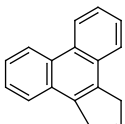
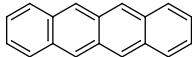
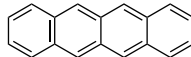
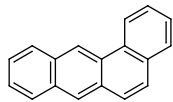
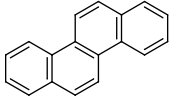
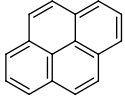
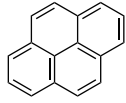
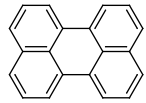
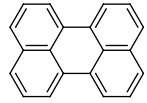
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CAS RN: 1296211-78-3

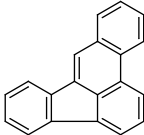
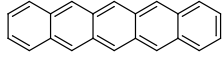
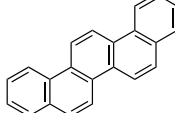
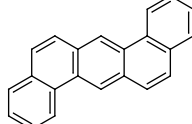
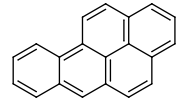

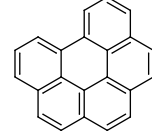
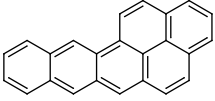
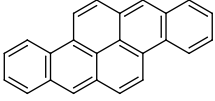
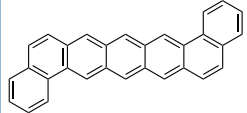
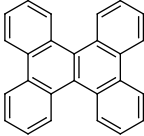
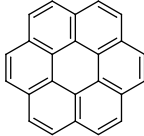
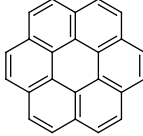
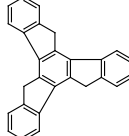
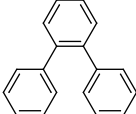
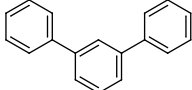
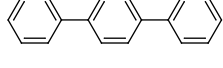
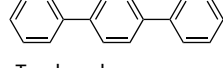
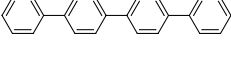
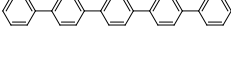
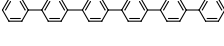
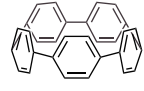
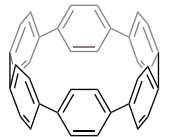
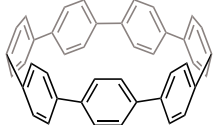
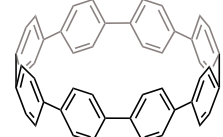
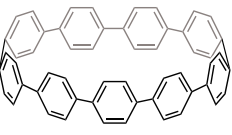
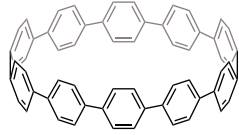
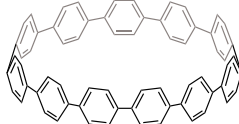
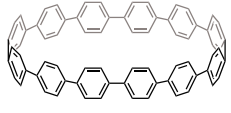
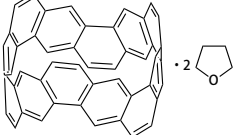
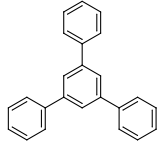
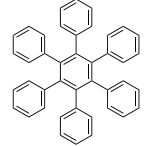
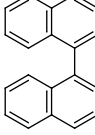
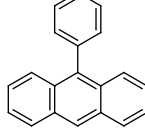
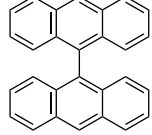
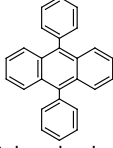
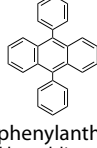
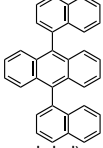
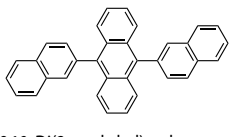
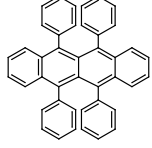
石墨烯/石墨烯氧化物

(GOs)

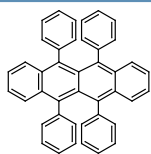
Graphene / Graphene Oxides (GOs)

G0499 1g 5g	G0441 5g 25g	G0442 5g 25g
Graphene Nanoplatelets 2-10nm(thick), 5µm(wide) CAS RN: 1034343-98-0	Graphene Nanoplatelets 6-8nm(thick), 5µm(wide) CAS RN: 1034343-98-0	Graphene Nanoplatelets 6-8nm(thick), 15µm(wide) CAS RN: 1034343-98-0

G0438 5g 25g Graphene Nanoplatelets 6-8nm(thick), 25 μ m(wide) CAS RN: 1034343-98-0	G0500 5g 25g Graphene Nanoplatelets Aggregates (sub-micron particles, surface area 300m ² /g) CAS RN: 1034343-98-0	G0501 5g 25g Graphene Nanoplatelets Aggregates (sub-micron particles, surface area 500m ² /g) CAS RN: 1034343-98-0	G0502 5g 25g Graphene Nanoplatelets Aggregates (sub-micron particles, surface area 750m ² /g) CAS RN: 1034343-98-0	G0443 100mg Graphene Oxide
G0557 5mL 25mL 100mL Graphene Oxide (10mg/mL, Dispersion in Water)	G0539 200mg Graphitic Carbon Nitride CAS RN: 143334-20-7			
纳米金刚石(NDs) Nanodiamonds(NDs)		N0962 1g 5g Nanodiamond (particle size : <10nm) CAS RN: 7782-40-3	N1082 5g Nanodiamond (particle size : <10nm) (5%, Dispersion in Water) CAS RN: 7782-40-3	N1057 1g Nanodiamond (particle size : <10nm) (Hydrogen-terminated)
N0969 1g Nanodiamond (particle size : <10nm) (Carboxyl-modified)	N0968 1g Nanodiamond (particle size : <10nm) (Amine-modified)	N1083 5g 25g Nanodiamond (particle size : <10nm) (Amine-modified) (3%, Dispersion in Ethylene Glycol)		
纳米碳单元结构 Nanocarbon Unit Structures		A0005 5g 25g  Acenaphthylene CAS RN: 208-96-8	A0992 25g  Anthracene (>96.0%) CAS RN: 120-12-7	A0495 25g 100g 500g  Anthracene (>97.0%) CAS RN: 120-12-7
A0405 1sample  Anthracene Zone Refined (number of passes:30) CAS RN: 120-12-7	P0079 25g 500g  Phenanthrene CAS RN: 85-01-8	P0331 1sample  Phenanthrene Zone Refined (number of passes:30) CAS RN: 85-01-8	F0016 25g 100g 500g  Fluoranthene CAS RN: 206-44-0	T0513 100mg 1g  Triphenylene CAS RN: 217-59-4
T3267 200mg 1g  Triphenylene (purified by sublimation) CAS RN: 217-59-4	C1689 100mg  1H-Cyclopenta[1]phenanthrene CAS RN: 235-92-7	N0001 100mg 1g 5g  Naphthacene CAS RN: 92-24-0	N0951 200mg 1g  Naphthacene (purified by sublimation) CAS RN: 92-24-0	B0017 1g 5g 25g  Tetraphene CAS RN: 56-55-3
C0339 100mg 1g  Chrysene (purified by sublimation) CAS RN: 218-01-9	P1104 25g 100g 500g  Pyrene CAS RN: 129-00-0	P2072 1g  Pyrene (purified by sublimation) CAS RN: 129-00-0	P0078 5g 25g  Perylene CAS RN: 198-55-0	P1629 1g  Perylene (purified by sublimation) CAS RN: 198-55-0

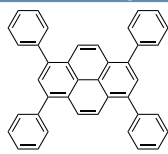
<p>B2982 100mg</p>  <p>Benzo[b]fluoranthene CAS RN: 205-99-2</p>	<p>P0030 100mg 1g</p>  <p>Pentacene (purified by sublimation) CAS RN: 135-48-8</p>	<p>P2207 100mg 500mg</p>  <p>Picene (purified by sublimation) (>99.9%) CAS RN: 213-46-7</p>	<p>D0145 100mg</p>  <p>Dibenz[a,h]anthracene CAS RN: 53-70-3</p>	<p>B0085 100mg 1g</p>  <p>3,4-Benzopyrene (purified by sublimation) CAS RN: 50-32-8</p>
<p>C2572 20mg 100mg</p>  <p>Corannulene CAS RN: 5821-51-2</p>	<p>B2983 100mg</p>  <p>Benzo[ghi]perylene CAS RN: 191-24-2</p>	<p>N0599 100mg</p>  <p>Naphtho[2,3-a]pyrene CAS RN: 196-42-9</p>	<p>D1005 100mg</p>  <p>Dibenzo[a,h]pyrene CAS RN: 189-64-0</p>	<p>D5488 100mg</p>  <p>Dibenzo[a,l]pentacene CAS RN: 227-09-8</p>
<p>D3736 200mg 1g</p>  <p>Dibenzog,p]chrysene CAS RN: 191-68-4</p>	<p>C0386 1g 5g</p>  <p>Coronene CAS RN: 191-07-1</p>	<p>C1961 100mg</p>  <p>Coronene (purified by sublimation) CAS RN: 191-07-1</p>	<p>T2752 100mg 1g</p>  <p>Truxene CAS RN: 548-35-6</p>	<p>T0019 25g 100g 500g</p>  <p>o-Terphenyl CAS RN: 84-15-1</p>
<p>T0018 25g 100g 500g</p>  <p>m-Terphenyl CAS RN: 92-06-8</p>	<p>T0020 25g 100g 500g</p>  <p>p-Terphenyl CAS RN: 92-94-4</p>	<p>T3263 5g 25g</p>  <p>p-Terphenyl (purified by sublimation) CAS RN: 92-94-4</p>	<p>Q0001 1g 5g 25g</p>  <p>p-Quaterphenyl CAS RN: 135-70-6</p>	<p>Q0018 100mg 1g</p>  <p>p-Quinquephenyl CAS RN: 3073-05-0</p>
<p>S0220 100mg 1g</p>  <p>p-Sexiphenyl CAS RN: 4499-83-6</p>	<p>C2931 20mg 100mg</p>  <p>[5]Cycloparaphenylene CAS RN: 96100-94-6</p>	<p>C3386 20mg</p>  <p>[6]Cycloparaphenylene CAS RN: 156980-13-1</p>	<p>C3571 10mg</p>  <p>[7]Cycloparaphenylene CAS RN: 1222105-42-1</p>	<p>C3544 20mg</p>  <p>[8]Cycloparaphenylene CAS RN: 1217269-85-6</p>
<p>C3465 20mg</p>  <p>[9]Cycloparaphenylene CAS RN: 1092522-74-1</p>	<p>C3493 20mg</p>  <p>[10]Cycloparaphenylene CAS RN: 1222105-46-5</p>	<p>C3536 10mg</p>  <p>[11]Cycloparaphenylene CAS RN: 1222105-48-7</p>	<p>C2449 10mg</p>  <p>[12]Cycloparaphenylene CAS RN: 1092522-75-2</p>	<p>I1078 10mg</p>  <p>(6,6)Carbon Nanobelt Bis(tetrahydrofuran) Adduct</p>
<p>T0509 25g</p>  <p>1,3,5-Triphenylbenzene CAS RN: 612-71-5</p>	<p>H1412 1g 5g</p>  <p>Hexaphenylbenzene CAS RN: 992-04-1</p>	<p>B0805 1g 5g</p>  <p>1,1'-Binaphthyl CAS RN: 604-53-5</p>	<p>P0138 1g 5g 25g</p>  <p>9-Phenylanthracene CAS RN: 602-55-1</p>	<p>B4095 1g 5g</p>  <p>9,9'-Bianthryl CAS RN: 1055-23-8</p>
<p>D1689 1g 25g</p>  <p>9,10-Diphenylanthracene CAS RN: 1499-10-1</p>	<p>D4401 1g</p>  <p>9,10-Diphenylanthracene (purified by sublimation) CAS RN: 1499-10-1</p>	<p>D3975 1g 5g</p>  <p>9,10-Di(1-naphthyl)anthracene CAS RN: 26979-27-1</p>	<p>D4127 1g</p>  <p>9,10-Di(2-naphthyl)anthracene CAS RN: 122648-99-1</p>	<p>T0561 100mg 1g</p>  <p>Rubrene CAS RN: 517-51-1</p>

T2233 250mg 1g



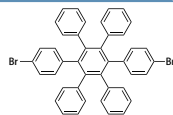
Rubrene (purified by sublimation)
CAS RN: 517-51-1

T3042 50mg 200mg



1,3,6,8-Tetraphenylpyrene
CAS RN: 13638-82-9

B5986 1g 5g



4-Bromo-4'-(4-bromophenyl)-
3',5,6'-triphenyl-1,1':2,1''-
terphenyl
CAS RN: 22932-54-3



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