

# Solar Cell Materials



Perovskite Solar Cell (PSC) Materials

Organic Photovoltaics (OPV) Materials

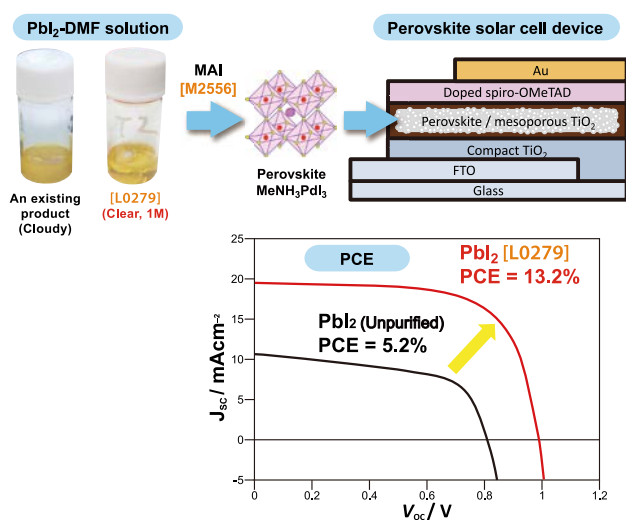
Dye-Sensitized Solar Cell (DSSC) Materials

# Solar Cell Materials

Sunlight is one of the renewable energy sources that can globally contribute to environmental and energy solutions in the 21st century. In order to use sunlight as efficiently as possible, low cost and efficient solar cells have been vigorously developed for practical use. As is generally known, practical silicon-based solar cells involve high manufacturing cost, as well as any other inorganic-based solar cells. On the basis of the cost problem, we have developed new solar cells based on organic and organic-inorganic hybrid materials.

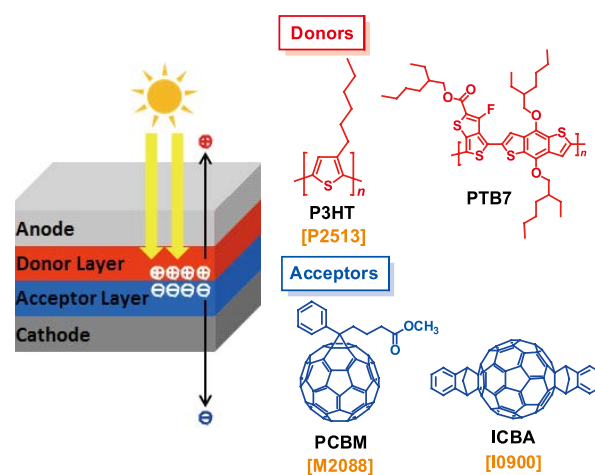
## 1. Perovskite Solar Cell (PSC) Materials

A perovskite solar cell, that was first reported by Miyasaka *et al.* in 2009, has recently received much attention.<sup>1)</sup> The organic-inorganic perovskite,  $\text{RNH}_3\text{PbX}_3$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}; \text{R} = \text{Me}, \text{NH}=\text{CH}$ , etc.), can function as a light absorption layer. Since 2012, power conversion efficiency (PCE) of the perovskite solar cell has been drastically improved and it has reached >15% better than those of OPV and DSSC.<sup>2-5)</sup> A device of the perovskite solar cell is solution-processible for fabrication at low cost. The organic-inorganic perovskites  $\text{RNH}_3\text{PbX}_3$  are easily prepared from HX salts of organic amines and lead halides. A modification of the halide X in the  $(\text{MeNH}_3)\text{PbX}_3$  can control the range of absorption wavelength.<sup>6)</sup> The perovskite compound with  $\text{X} = \text{Br}$  is useful for light absorption in shorter wavelengths and the compound with  $\text{X} = \text{I}$  is relatively useful for that in longer wavelengths. Wakamiya *et al.* reported that use of highly dried lead(II) iodide is a key to fabricate efficient perovskite solar cell devices (PCE > 10%) with high reproducibility.<sup>7,8)</sup> Carrier behavior in the perovskite layer is different from that in OPV, thus there are free carriers in which electrons and holes can be movable freely.<sup>9)</sup> According to the reason, the perovskite layer can transport both electron and hole carriers without recombination.



## 2. Organic Photovoltaics (OPV) Materials

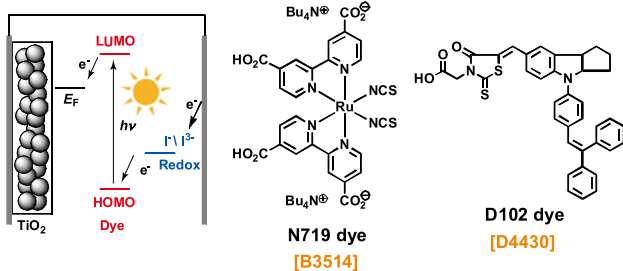
A prototype of organic photovoltaics (OPV) was reported by Tang *et al.* in 1986.<sup>10)</sup> In order to fabricate an OPV device, we can use highly productive methods such as printing and roll-to-roll methods. The OPV device usually requires bulk heterojunctions (BHJ) which can be fabricated by mixing an electron-donor ( $p$ -type semiconductor) and electron-acceptor ( $n$ -type semiconductor).<sup>11)</sup> The former material involves a  $\pi$ -conjugated polymer and a small molecule semiconductor, and the latter material is normally a fullerene derivative. PCBM, that is a solubility-enhanced fullerene, efficiently provides a bulk heterojunction.<sup>12)</sup> ICBM gives a high open-circuit voltage because it has a higher energy LUMO than that of PCBM.<sup>13)</sup> A  $\text{C}_{70}$  derivative usually gives higher cell efficiency compared with that of the corresponding  $\text{C}_{60}$  one, because the  $\text{C}_{70}$  derivative absorbs light better than the  $\text{C}_{60}$ .<sup>14)</sup> We can introduce an acceptor component into the structure of a  $p$ -type semiconducting polymer to form a donor-acceptor (DA-type) polymer, that shows light absorption in the long wavelength area based on a charge transfer.<sup>15)</sup>



## 3. Dye-Sensitized Solar Cell (DSSC) Materials

Grätzel *et al.* first developed a dye-sensitized solar cell (DSSC) in 1991.<sup>16)</sup> The DSSC is a liquid-type device that involves nanoporous titanium oxide ( $\text{TiO}_2$ ) as a semiconducting electrode, organic dye-sensitizer and an electrolyte solution containing a redox component. This is expected to be a low cost solar cell, because there is a simple device structure compared with other solar cells.<sup>17)</sup> The DSSC is usable under conditions with weak light. Thus, it is expected that the DSSC may be installed in a room. A ruthenium complex with a bipyridine ligand is one popular organic dye for solar cells.<sup>18)</sup> In the polypyridine ligand of

the ruthenium complex, we can introduce some carboxyl or phosphonic acid groups forming a linkage with  $\text{TiO}_2$ . In addition, metal-free organic dyes (eg. D-102, D-131 and D-358) were also developed, because they do not contain any expensive ruthenium atoms.<sup>19,20</sup> Recently, efficient green-colored zinc-porphyrin dyes were developed for DSSC showing more than 10% of PCE.<sup>21,22</sup> Furthermore, efficient blue-colored metal-free organic dyes having a diketopyrrolopyrrole structure were developed for DSSC (PCE > 10%).<sup>23</sup>



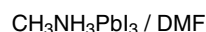
## References

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# Perovskite Solar Cell (PSC) Materials

## Lead Halides

P2415 1g 5g 25g



PbI<sub>2</sub>/MAI(1:1) - DMF Complex  
(99.99%, trace metals basis)  
[for Perovskite precursor]

L0279 1g 5g 25g 100g 1kg



Lead(II) Iodide  
[for Perovskite precursor]  
CAS RN: 10101-63-0

L0288 1g 5g 25g



Lead(II) Bromide  
[for Perovskite precursor]  
CAS RN: 10031-22-8

L0291 1g 5g



Lead(II) Chloride  
(purified by sublimation)  
[for Perovskite precursor]  
CAS RN: 7758-95-4

L0292 1g 5g 25g



Lead(II) Chloride  
[for Perovskite precursor]  
CAS RN: 7758-95-4

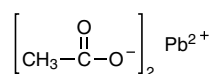
C3569 1g 5g



Cesium Lead Tribromide  
(Low water content)  
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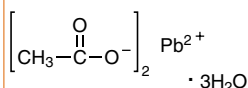
## Other Lead Compounds

L0315 1g 5g 25g



Lead(II) Acetate  
[for Perovskite precursor]  
CAS RN: 301-04-2

L0330 25g 100g



Lead(II) Acetate Trihydrate  
CAS RN: 6080-56-4

## Bismuth Halides

B5787 5g 25g



Bismuth(III) Iodide Anhydrous  
CAS RN: 7787-64-6

## Tin Halides

T3449 1g 5g



Tin(II) Iodide  
[for Perovskite precursor]  
CAS RN: 10294-70-9

## Cesium Halides

C2205 25g



Cesium Iodide  
CAS RN: 7789-17-5

C2202 25g 100g



Cesium Bromide  
CAS RN: 7787-69-1

C2203 25g 100g

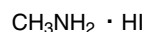


Cesium Chloride  
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## Organic Onium Salts

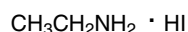
## Iodide Salts

M2556 1g 5g 25g 100g



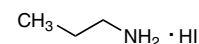
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(Low water content)  
CAS RN: 14965-49-2

E1045 1g 5g



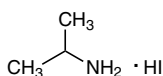
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CAS RN: 506-58-1

P2212 1g 5g



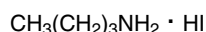
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I0934 1g 5g



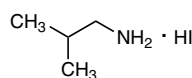
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B4433 1g 5g



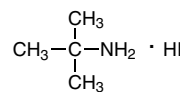
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I0935 1g 5g



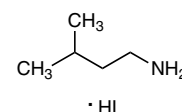
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B4434 1g 5g



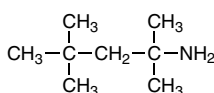
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I1095 1g 5g



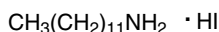
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T3785 1g 5g



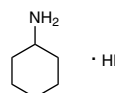
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D5538 1g 5g



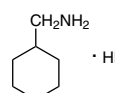
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C3532 1g 5g



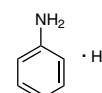
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C3425 1g 5g



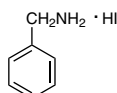
Cyclohexanemethylamine Hydroiodide

A2778 1g 5g



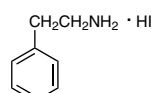
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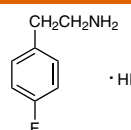
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P2213 1g 5g



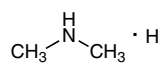
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F1203 1g 5g



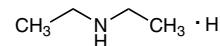
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D4555 1g 5g


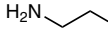
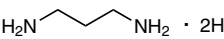
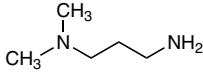
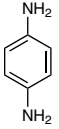

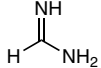
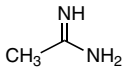
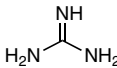


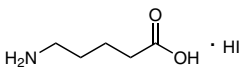
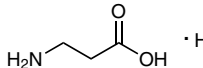
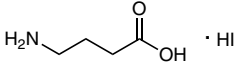
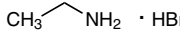
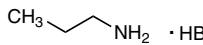
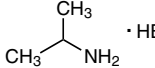
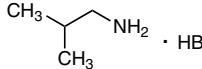
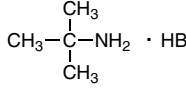


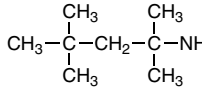



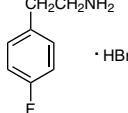

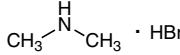
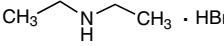
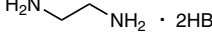

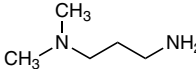


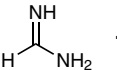
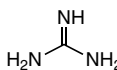


Dimethylamine Hydroiodide  
CAS RN: 51066-74-1

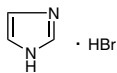
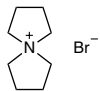
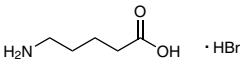
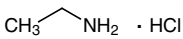
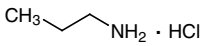
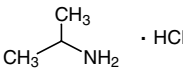
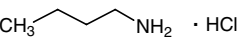
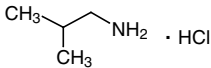
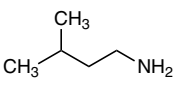
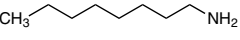
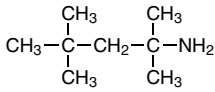

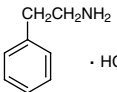
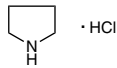
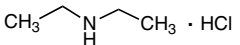
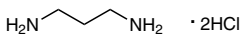
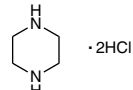
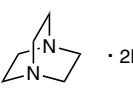
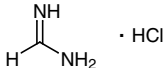
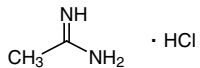
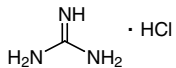
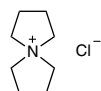
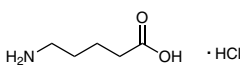
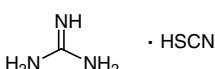
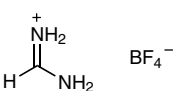
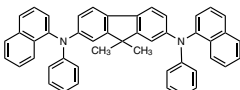
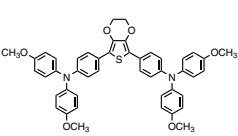
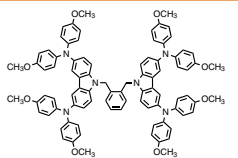
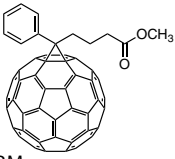
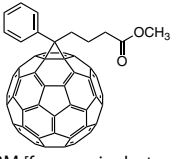

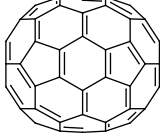
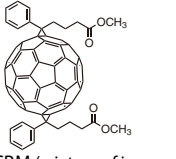
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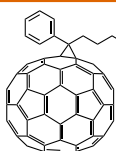
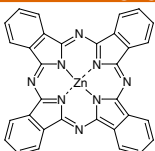
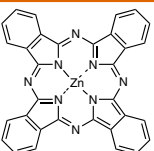
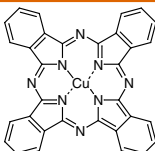
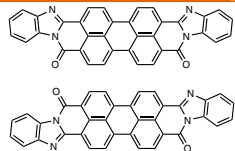
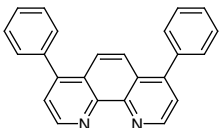
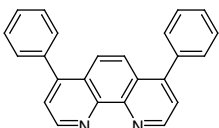
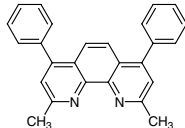
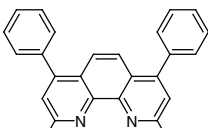
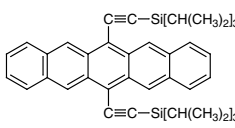
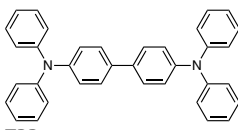
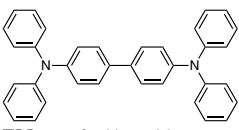
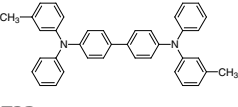
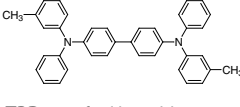
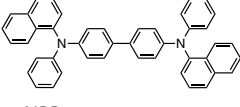
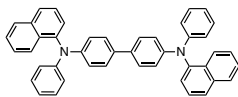
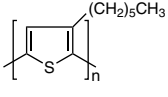

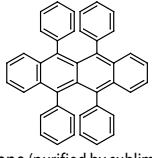
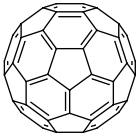
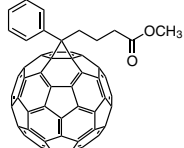
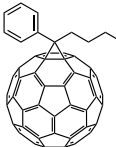
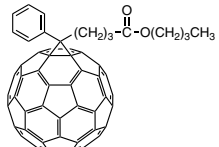
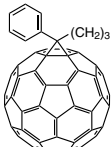
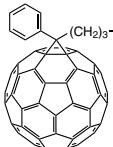

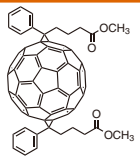
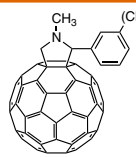
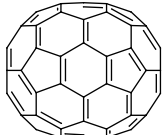
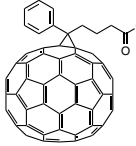
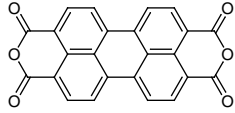
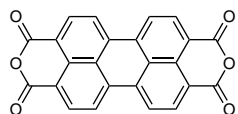
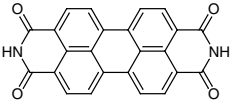
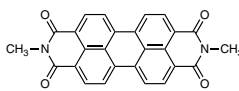
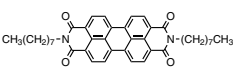
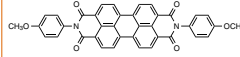


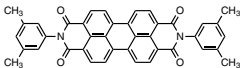
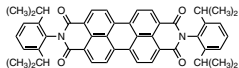
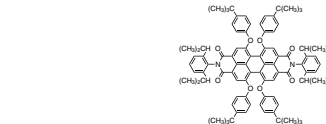
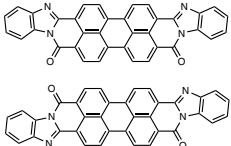
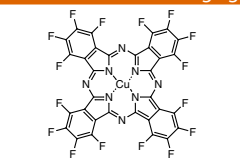
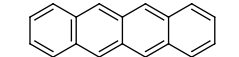
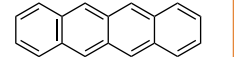
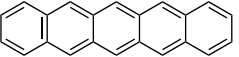
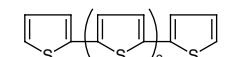
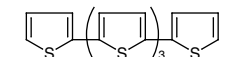
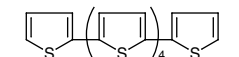
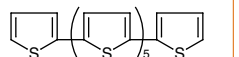
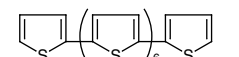
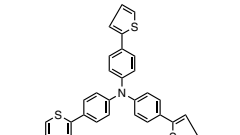
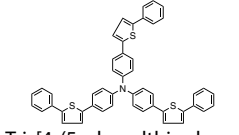
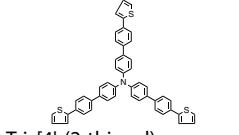
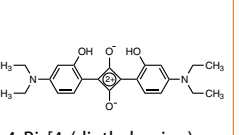
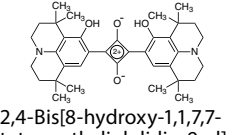
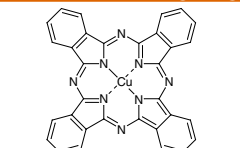
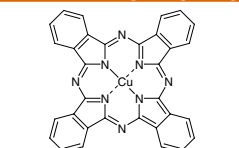
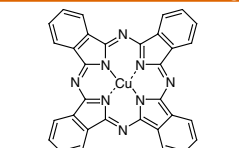
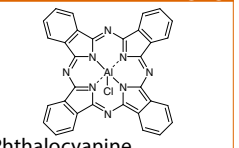
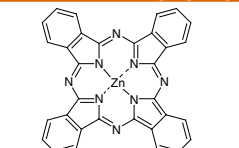
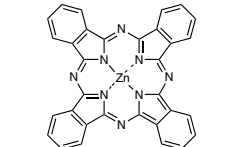
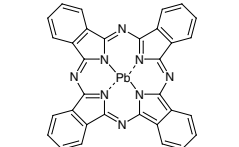
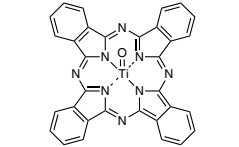
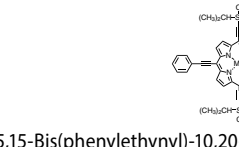
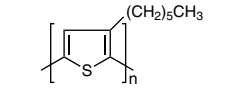
Diethylamine Hydroiodide  
CAS RN: 19833-78-4

<b>P2486</b> 1g 5g  Pyrrolidine Hydroiodide CAS RN: 45361-12-4	<b>E1222</b> 1g 5g  Ethylenediamine Dihydroiodide CAS RN: 5700-49-2	<b>D5091</b> 1g 5g  1,3-Diaminopropane Dihydroiodide CAS RN: 120675-53-8	<b>D5619</b> 1g 5g  3-(Dimethylamino)propylamine Dihydroiodide • 2HI	<b>P2389</b> 1g  1,4-Phenylenediamine Dihydroiodide CAS RN: 116469-02-4
<b>P2492</b> 1g 5g  Piperazine Dihydroiodide CAS RN: 58464-47-4	<b>F0974</b> 1g 5g 25g  Formamidine Hydroiodide (Low water content) CAS RN: 879643-71-7	<b>A2902</b> 1g 5g  Acetamidine Hydroiodide CAS RN: 1452099-14-7	<b>G0450</b> 1g 5g  Guanidine Hydroiodide CAS RN: 19227-70-4	<b>I0970</b> 1g 5g  Imidazole Hydroiodide CAS RN: 68007-08-9
<b>A3093</b> 1g 5g  5-Azoniaspiro[4.4]nonane Iodide CAS RN: 45650-35-9	<b>A2984</b> 1g 5g  5-Aminovaleric Acid Hydroiodide (Low water content) CAS RN: 1705581-28-7	<b>A3112</b> 1g 5g  beta-Alanine Hydroiodide (Low water content) CAS RN: 2096495-59-7	<b>A3113</b> 1g 5g  GABA-HI CAS RN: 2096495-60-0	<b>Bromide Salts</b>
<b>M2589</b> 1g 5g 25g $\text{CH}_3\text{NH}_2 \cdot \text{HBr}$ Methylamine Hydrobromide CAS RN: 6876-37-5	<b>E0056</b> 25g 500g  Ethylamine Hydrobromide CAS RN: 593-55-5	<b>P2502</b> 1g 5g  Propylamine Hydrobromide CAS RN: 4905-83-3	<b>I1041</b> 1g 5g  Isopropylamine Hydrobromide CAS RN: 29552-58-7	
<b>I1007</b> 1g 5g  Isobutylamine Hydrobromide CAS RN: 74098-36-5	<b>B5187</b> 1g 5g  tert-Butylamine Hydrobromide CAS RN: 60469-70-7	<b>H1678</b> 1g 5g  Hexylamine Hydrobromide CAS RN: 7334-95-4	<b>O0442</b> 1g 5g  n-Octylamine Hydrobromide CAS RN: 14846-47-0	<b>T3783</b> 1g 5g  tert-Octylamine Hydrobromide CAS RN: 1093859-61-0
<b>D5537</b> 1g 5g $\text{CH}_3(\text{CH}_2)_{11}\text{NH}_2 \cdot \text{HBr}$ Dodecylamine Hydrobromide CAS RN: 26204-55-7	<b>A2985</b> 1g 5g  Aniline Hydrobromide CAS RN: 542-11-0	<b>B5185</b> 1g 5g  Benzylamine Hydrobromide CAS RN: 37488-40-7	<b>P2388</b> 1g 5g  2-Phenylethylamine Hydrobromide CAS RN: 53916-94-2	<b>F1229</b> 1g 5g  4-Fluorophenethylamine Hydrobromide CAS RN: 1807536-06-6
<b>P2484</b> 1g 5g  Pyrrolidine Hydrobromide CAS RN: 55810-80-5	<b>D5092</b> 1g 5g  Dimethylamine Hydrobromide CAS RN: 6912-12-5	<b>D4667</b> 1g 5g  Diethylamine Hydrobromide CAS RN: 6274-12-0	<b>E1221</b> 1g 5g  Ethylenediamine Dihydrobromide CAS RN: 624-59-9	<b>D5090</b> 1g 5g  1,3-Diaminopropane Dihydrobromide CAS RN: 18773-03-0
<b>D5618</b> 1g 5g  3-(Dimethylamino)propylamine Dihydrobromide • 2HBr	<b>P2490</b> 1g 5g  Piperazine Dihydrobromide CAS RN: 59813-05-7	<b>D5250</b> 1g 5g  1,4-Diazabicyclo[2.2.2]octane Dihydrobromide CAS RN: 54581-69-0	<b>F0973</b> 1g 5g 25g  Formamidine Hydrobromide CAS RN: 146958-06-7	<b>G0449</b> 1g 5g  Guanidine Hydrobromide CAS RN: 19244-98-5



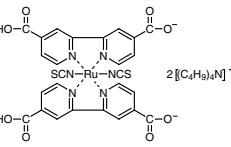
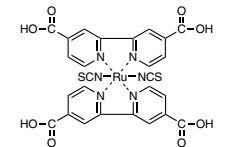
<p><b>I1006</b> 1g 5g</p>  <p>Imidazole Hydrobromide (Low water content) CAS RN: 101023-55-6</p>	<p><b>A3091</b> 1g 5g</p>  <p>5-Azoniaspiro[4.4]nonane Bromide CAS RN: 16450-38-7</p>	<p><b>A3094</b> 1g 5g</p>  <p>5-Aminovaleric Acid Hydrobromide (Low water content)</p>	<p><b>Chloride Salts</b></p>	<p><b>M0138</b> 25g 500g</p> <p><math>\text{CH}_3\text{NH}_2 \cdot \text{HCl}</math></p> <p>Methylamine Hydrochloride CAS RN: 593-51-1</p>
<p><b>E0205</b> 25g 500g</p>  <p>Ethylamine Hydrochloride CAS RN: 557-66-4</p>	<p><b>P0522</b> 25g</p>  <p>Propylamine Hydrochloride CAS RN: 556-53-6</p>	<p><b>I0166</b> 25g 100g 500g</p>  <p>Isopropylamine Hydrochloride CAS RN: 15572-56-2</p>	<p><b>B0710</b> 25g 500g</p>  <p>Butylamine Hydrochloride CAS RN: 3858-78-4</p>	<p><b>I0096</b> 25g 500g</p>  <p>Isobutylamine Hydrochloride CAS RN: 5041-09-8</p>
<p><b>I0083</b> 1g 5g</p>  <p>Isopentylamine Hydrochloride CAS RN: 541-23-1</p>	<p><b>O0484</b> 1g 5g</p>  <p>n-Octylamine Hydrochloride CAS RN: 142-95-0</p>	<p><b>T3784</b> 1g 5g</p>  <p>tert-Octylamine Hydrochloride CAS RN: 58618-91-0</p>	<p><b>B0407</b> 25g 100g 500g</p>  <p>Benzylamine Hydrochloride CAS RN: 3287-99-8</p>	<p><b>P0086</b> 25g 100g 500g</p>  <p>2-Phenylethylamine Hydrochloride CAS RN: 156-28-5</p>
<p><b>P2485</b> 1g 5g</p>  <p>Pyrrolidine Hydrochloride CAS RN: 25150-61-2</p>	<p><b>D0468</b> 25g 500g</p>  <p>Diethylamine Hydrochloride CAS RN: 660-68-4</p>	<p><b>D5253</b> 1g 5g</p>  <p>1,3-Diaminopropane Dihydrochloride (Low water content) CAS RN: 10517-44-9</p>	<p><b>P2491</b> 1g 5g</p>  <p>Piperazine Dihydrochloride CAS RN: 142-64-3</p>	<p><b>D5251</b> 1g 5g</p>  <p>1,4-Diazabicyclo[2.2.2]octane Dihydrochloride CAS RN: 49563-87-3</p>
<p><b>F0103</b> 5g 25g</p>  <p>Formamidinium Hydrochloride CAS RN: 6313-33-3</p>	<p><b>A0008</b> 25g 500g</p>  <p>Acetamidinium Hydrochloride CAS RN: 124-42-5</p>	<p><b>G0162</b> 25g 500g</p>  <p>Guanidinium Hydrochloride CAS RN: 50-01-1</p>	<p><b>A3092</b> 1g 5g</p>  <p>5-Azoniaspiro[4.4]nonane Chloride CAS RN: 98997-63-8</p>	<p><b>A0436</b> 1g 5g</p>  <p>5-Aminovaleric Acid Hydrochloride (Low water content) CAS RN: 627-95-2</p>
<p><b>Pseudo Halide Salts</b></p>	<p><b>M2991</b> 1g 5g</p> <p><math>\text{CH}_3\text{NH}_2 \cdot \text{HSCN}</math></p> <p>Methylamine Thiocyanate CAS RN: 61540-63-4</p>	<p><b>G0230</b> 25g 500g</p>  <p>Guanidinium Thiocyanate CAS RN: 593-84-0</p>	<p><b>F1152</b> 1g 5g</p>  <p>Formamidinium Tetrafluoroborate</p>	<p><b>M2990</b> 1g 5g</p> <p><math>\text{CH}_3\text{NH}_3^+ \text{BF}_4^-</math></p> <p>Methylammonium Tetrafluoroborate CAS RN: 42539-74-2</p>
<p><b>M3134</b> 1g 5g</p> <p><math>\text{CH}_3\text{NH}_2 \cdot \text{HOCN}</math></p> <p>Methylamine Cyanate CAS RN: 63405-91-4</p>	<p><b>Carrier Transport Materials</b></p>	<p><b>B4926</b> 200mg 1g</p>  <p>DMFL-NPB CAS RN: 222319-05-3</p>	<p><b>D5155</b> 200mg</p>  <p>H101 CAS RN: 1622008-73-4</p>	<p><b>V0146</b> 1g 5g</p>  <p>V886 CAS RN: 1801701-58-5</p>
<p><b>M2088</b> 100mg</p>  <p>PCBM CAS RN: 160848-22-6</p>	<p><b>P2682</b> 100mg</p>  <p>PCBM [for organic electronics] CAS RN: 160848-22-6</p>	<p><b>B1641</b> 100mg 1g</p>  <p>C<sub>60</sub> (pure) CAS RN: 99685-96-8</p>	<p><b>B1694</b> 100mg</p>  <p>C<sub>70</sub> CAS RN: 115383-22-7</p>	<p><b>B4576</b> 50mg</p>  <p>Bis-PCBM (mixture of isomers) CAS RN: 1048679-01-1</p>

<b>M2550</b> 50mg  [70]PCBM (mixture of isomers) CAS RN: 609771-63-3	<b>P0767</b> 1g 5g 25g  Zinc Phthalocyanine CAS RN: 14320-04-8	<b>Z0037</b> 500mg  ZnPc (purified by sublimation) CAS RN: 14320-04-8	<b>P1628</b> 1g  CuPc (purified by sublimation) CAS RN: 147-14-8	<b>P2119</b> 200mg  PTCBI ( <i>cis</i> - and <i>trans</i> - mixture) CAS RN: 79534-91-1
<b>D0905</b> 1g 5g  Bathophenanthroline CAS RN: 1662-01-7	<b>B2695</b> 1g  Bphen (purified by sublimation) CAS RN: 1662-01-7	<b>B2694</b> 1g 5g  Bathocuproine (purified by sublimation) CAS RN: 4733-39-5	<b>D0711</b> 1g 5g  Bathocuproine CAS RN: 4733-39-5	<b>B3562</b> 100mg  TIPS Pentacene (This product is unavailable in the U.S.) CAS RN: 373596-08-8
<b>T1812</b> 5g 25g  TPB CAS RN: 15546-43-7	<b>T3266</b> 1g 5g  TPB (purified by sublimation) CAS RN: 15546-43-7	<b>D2448</b> 1g 5g  TPD CAS RN: 65181-78-4	<b>D3236</b> 1g 5g  TPD (purified by sublimation) CAS RN: 65181-78-4	<b>D5126</b> 1g 5g  $\alpha$ -NPB CAS RN: 123847-85-8
<b>D3970</b> 1g 5g  $\alpha$ -NPB (purified by sublimation) CAS RN: 123847-85-8	<b>P2513</b> 100mg 500mg  P3HT (regioregular) CAS RN: 125321-66-6	<b>T0561</b> 100mg 1g  Rubrene CAS RN: 517-51-1	<b>T2233</b> 250mg 1g  Rubrene (purified by sublimation) CAS RN: 517-51-1	
<b>Organic Solar Cell (OPV) Materials</b>		<b>Acceptor Materials</b>		<b>B1641</b> 100mg 1g  C <sub>60</sub> (pure) CAS RN: 99685-96-8
				<b>M2088</b> 100mg  PCBM CAS RN: 160848-22-6
<b>P2682</b> 100mg  PCBM [for organic electronics] CAS RN: 160848-22-6	<b>P2013</b> 100mg  PCBB CAS RN: 571177-66-7	<b>P2014</b> 100mg  PCBO CAS RN: 571177-68-9	<b>P2015</b> 100mg  [60]PCB-C <sub>12</sub> CAS RN: 571177-69-0	<b>I0900</b> 50mg  ICBA CAS RN: 1207461-57-1
<b>B4576</b> 50mg  Bis-PCBM (mixture of isomers) CAS RN: 1048679-01-1	<b>C2415</b> 100mg  C <sub>60</sub> MC <sub>12</sub> CAS RN: 403483-19-2	<b>B1694</b> 100mg  C <sub>70</sub> CAS RN: 115383-22-7	<b>M2550</b> 50mg  [70]PCBM (mixture of isomers) CAS RN: 609771-63-3	<b>P0972</b> 25g 100g 500g  Pigment Red 224 CAS RN: 128-69-8
<b>P2102</b> 1g  Pigment Red 224 (purified by sublimation) CAS RN: 128-69-8	<b>P0984</b> 25g  3,4,9,10-Perylene-tetracarboxylic Diimide CAS RN: 81-33-4	<b>D4429</b> 1g 5g  Pigment Red 179 CAS RN: 5521-31-3	<b>D4175</b> 1g  PTCDI-C <sub>8</sub> CAS RN: 78151-58-3	<b>B2892</b> 1g 5g  Pigment Red 190 CAS RN: 6424-77-7

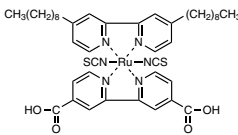
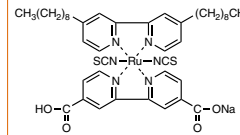
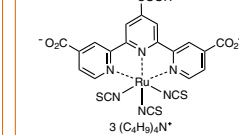
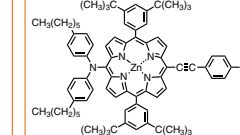
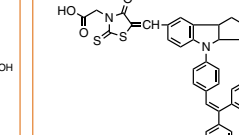
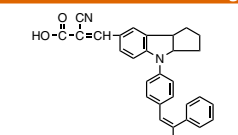
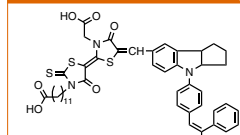
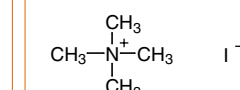
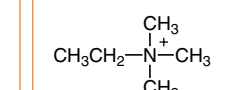
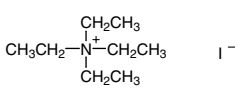
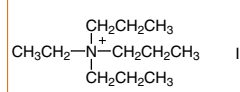
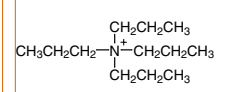
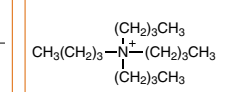
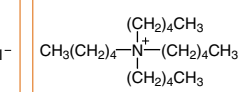
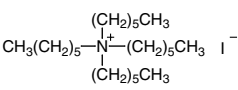
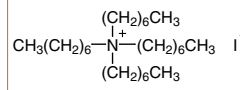
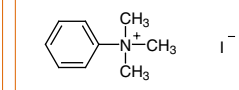
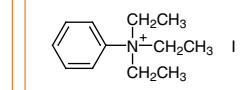
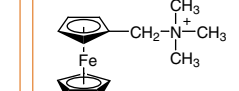
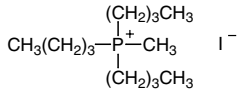
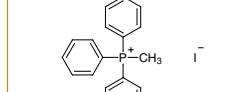
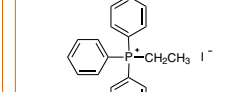
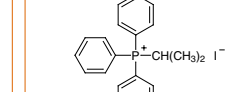
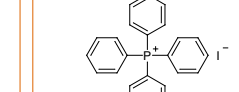
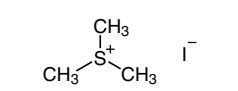
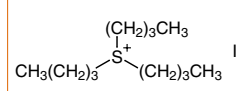
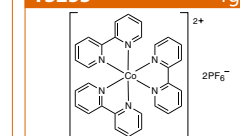
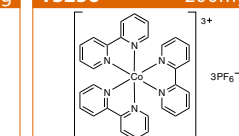
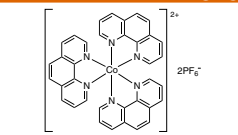
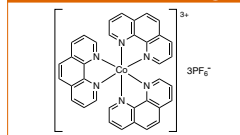
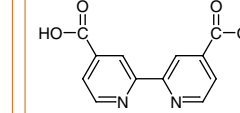
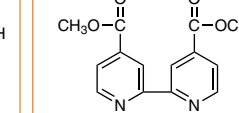
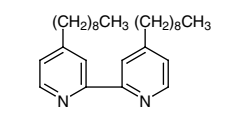
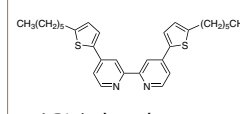
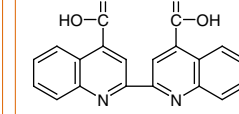
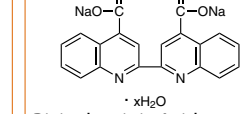
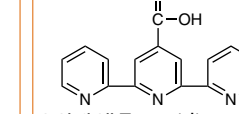
<p><b>B4231</b> 1g 5g</p>  <p><b>Pigment Red 149</b> CAS RN: 4948-15-6</p>	<p><b>B4268</b> 1g 5g</p>  <p><b>Perylene Orange</b> CAS RN: 82953-57-9</p>	<p><b>T3061</b> 200mg</p>  <p><b>1,6,7,12-Tetrakis(4-tert-butylphenoxy)-N,N'-bis(2,6-diisopropylphenyl)-3,4,9,10-perylenetetracarboxylic Diimide</b> CAS RN: 112078-08-7</p>	<p><b>P2119</b> 200mg</p>  <p><b>PTCBI (cis- and trans- mixture)</b> CAS RN: 79534-91-1</p>	
<p><b>H1194</b> 100mg 1g</p>  <p><b>F<sub>16</sub>CuPc (purified by sublimation)</b> CAS RN: 14916-87-1</p>	<p><b>Donor Materials</b></p>	<p><b>N0001</b> 100mg 1g 5g</p>  <p><b>Naphthacene</b> CAS RN: 92-24-0</p>	<p><b>N0951</b> 200mg 1g</p>  <p><b>Naphthacene (purified by sublimation)</b> CAS RN: 92-24-0</p>	<p><b>P0030</b> 100mg 1g</p>  <p><b>Pentacene (purified by sublimation)</b> CAS RN: 135-48-8</p>
<p><b>Q0078</b> 100mg</p>  <p><b>α-Quaterthiophene</b> CAS RN: 5632-29-1</p>	<p><b>Q0079</b> 100mg 500mg</p>  <p><b>α-Quinquethiophene</b> CAS RN: 5660-45-7</p>	<p><b>S0504</b> 100mg 1g</p>  <p><b>6T (purified by sublimation)</b> CAS RN: 88493-55-4</p>	<p><b>S0505</b> 100mg</p>  <p><b>α-Septithiophene</b> CAS RN: 86100-63-2</p>	<p><b>O0313</b> 100mg</p>  <p><b>α-Octithiophene</b> CAS RN: 113728-71-5</p>
<p><b>T3050</b> 1g 5g</p>  <p><b>Tris[4-(2-thienyl)phenyl]amine</b> CAS RN: 142807-63-4</p>	<p><b>T3328</b> 200mg</p>  <p><b>Tris[4-(5-phenylthiophen-2-yl)phenyl]amine</b> CAS RN: 803727-09-5</p>	<p><b>T3337</b> 200mg</p>  <p><b>Tris[4'-(2-thienyl)-4-biphenyl]amine</b> CAS RN: 1092356-36-9</p>	<p><b>B4342</b> 1g 5g</p>  <p><b>2,4-Bis[4-(diethylamino)-2-hydroxyphenyl]squaraine</b> CAS RN: 68842-66-0</p>	<p><b>B4649</b> 1g 5g</p>  <p><b>2,4-Bis[8-hydroxy-1,1,7,7-tetramethyljulolidin-9-yl]-squaraine</b> CAS RN: 358727-55-6</p>
<p><b>P1005</b> 25g 250g</p>  <p><b>Copper(II) Phthalocyanine (α-form)</b> CAS RN: 147-14-8</p>	<p><b>P1006</b> 25g 100g 500g</p>  <p><b>Copper(II) Phthalocyanine (β-form)</b> CAS RN: 147-14-8</p>	<p><b>P1628</b> 1g</p>  <p><b>CuPc (purified by sublimation)</b> CAS RN: 147-14-8</p>	<p><b>C1167</b> 1g 5g</p>  <p><b>Phthalocyanine Chloroaluminum</b> CAS RN: 14154-42-8</p>	<p><b>P0767</b> 1g 5g 25g</p>  <p><b>Zinc Phthalocyanine</b> CAS RN: 14320-04-8</p>
<p><b>Z0037</b> 500mg</p>  <p><b>ZnPc (purified by sublimation)</b> CAS RN: 14320-04-8</p>	<p><b>P0766</b> 1g 25g</p>  <p><b>Lead(II) Phthalocyanine</b> CAS RN: 15187-16-3</p>	<p><b>T2272</b> 200mg 1g</p>  <p><b>TiOPc (purified by sublimation)</b> CAS RN: 26201-32-1</p>	<p><b>B4314</b> 50mg</p>  <p><b>[5,15-Bis(phenylethynyl)-10,20-bis[(triisopropylsilyl)ethynyl]-porphyrinato]magnesium(II)</b> CAS RN: 1397288-30-0</p>	
<p><b>P2513</b> 100mg 500mg</p>  <p><b>P3HT (regioregular)</b> CAS RN: 125321-66-6</p>				

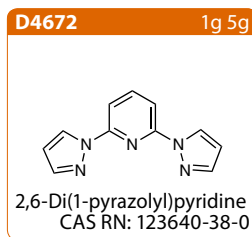
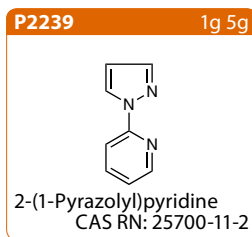
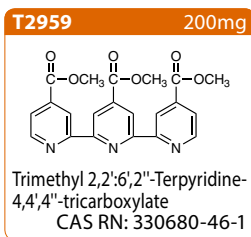
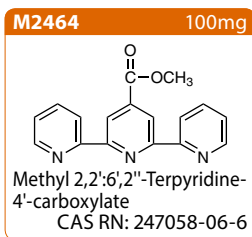
**Dye-Sensitized Solar Cell (DSSC) Materials**

**Dye Sensitizers**

<p><b>B3514</b> 100mg</p>  <p><b>N719 Dye</b> CAS RN: 207347-46-4</p>	<p><b>B4372</b> 200mg</p>  <p><b>N3 Dye</b> CAS RN: 141460-19-7</p>
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<b>B4373</b> 200mg  <b>Z907 Dye</b> CAS RN: 502693-09-6	<b>B4432</b> 200mg  <b>Z907 Dye Sodium Salt</b> CAS RN: 871466-65-8	<b>N1104</b> 100mg  <b>N749 Black Dye</b> CAS RN: 359415-47-7	<b>Y0011</b> 50mg  <b>YD2</b> CAS RN: 1201915-91-4	<b>D4430</b> 50mg  <b>D 102</b> CAS RN: 652145-28-3	
<b>D4431</b> 50mg  <b>D 131</b> CAS RN: 652145-29-4	<b>D4432</b> 50mg  <b>D 358</b> CAS RN: 1207638-53-6	<b>Electrolytes</b>		<b>T0139</b> 25g 100g 500g  <b>Tetramethylammonium iodide</b> CAS RN: 75-58-1	<b>E0190</b> 25g  <b>Ethyltrimethylammonium iodide</b> CAS RN: 51-93-4
<b>T0097</b> 25g 100g 500g  <b>Tetraethylammonium iodide</b> CAS RN: 68-05-3	<b>E0191</b> 25g  <b>Ethyltripropylammonium iodide</b> CAS RN: 15066-80-5	<b>T0172</b> 25g 500g  <b>Tetrapropylammonium iodide</b> CAS RN: 631-40-3	<b>T0057</b> 25g 100g 500g  <b>Tetrabutylammonium iodide</b> CAS RN: 311-28-4	<b>T1011</b> 5g 25g  <b>Tetraamylammonium iodide</b> CAS RN: 2498-20-6	
<b>T1010</b> 5g 25g  <b>Tetrahexylammonium iodide</b> CAS RN: 2138-24-1	<b>T1396</b> 25g  <b>Tetraheptylammonium iodide</b> CAS RN: 3535-83-9	<b>P0246</b> 25g  <b>Trimethylphenylammonium iodide</b> CAS RN: 98-04-4	<b>P0242</b> 25g  <b>Triethylphenylammonium iodide</b> CAS RN: 1010-19-1	<b>F0167</b> 5g  <b>(Ferrocenylmethyl)-trimethylammonium iodide</b> CAS RN: 12086-40-7	
<b>M1455</b> 5g 25g  <b>Tributylmethylphosphonium iodide</b> CAS RN: 1702-42-7	<b>M0253</b> 25g 100g 500g  <b>Methyltriphenylphosphonium iodide</b> CAS RN: 2065-66-9	<b>E0549</b> 25g 250g  <b>Ethyltriphenylphosphonium iodide</b> CAS RN: 4736-60-1	<b>I0552</b> 5g 25g  <b>Isopropyltriphenylphosphonium iodide</b> CAS RN: 24470-78-8	<b>T1450</b> 10g  <b>Tetraphenylphosphonium iodide</b> CAS RN: 2065-67-0	
<b>T1056</b> 25g 500g  <b>Trimethylsulfonium iodide</b> CAS RN: 2181-42-2	<b>T1564</b> 1g  <b>Tributylsulfonium iodide</b> CAS RN: 18146-62-8	<b>Hole Conductor Cobalt Dopants</b>		<b>T3255</b> 1g 5g  <b>Tris(2,2'-bipyridine)cobalt(II) Bis(hexafluorophosphate)</b> CAS RN: 79151-78-3	<b>T3256</b> 200mg 1g  <b>Tris(2,2'-bipyridine)cobalt(III) Tris(hexafluorophosphate)</b> CAS RN: 28277-53-4
<b>T3553</b> 1g 5g  <b>Tris(1,10-phenanthroline)cobalt(III) Bis(hexafluorophosphate)</b> CAS RN: 31876-74-1	<b>T3554</b> 1g 5g  <b>Tris(1,10-phenanthroline)cobalt(III) Tris(hexafluorophosphate)</b> CAS RN: 28277-59-0	<b>Ligands</b>		<b>B1876</b> 100mg 1g  <b>2,2'-Biisonicotinic Acid</b> CAS RN: 6813-38-3	<b>D4635</b> 1g 5g  <b>Dimethyl 2,2'-Bipyridine-4,4'-dicarboxylate</b> CAS RN: 71071-46-0
<b>D3917</b> 1g 5g  <b>4,4'-Dinonyl-2,2'-bipyridyl</b> CAS RN: 142646-58-0	<b>B4420</b> 200mg  <b>4,4'-Bis(5-hexyl-2-thienyl)-2,2'-bipyridyl</b> CAS RN: 1047684-56-9	<b>B3509</b> 1g 5g  <b>2,2'-Bicinchoninic Acid</b> CAS RN: 1245-13-2	<b>B4509</b> 1g 5g  <b>Bicinchoninic Acid Disodium Salt Hydrate</b> CAS RN: 979-88-4	<b>T3245</b> 200mg 1g  <b>2,2':6',2''-Terpyridine-4'-carboxylic Acid</b> CAS RN: 148332-36-9	



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