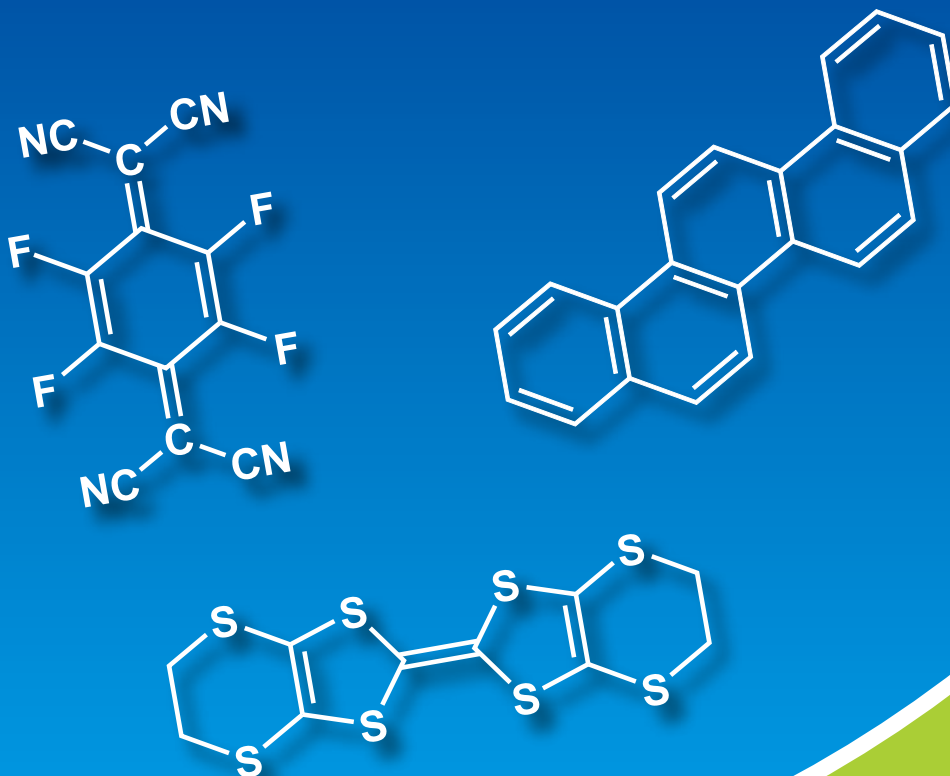


Molecular Conductors



Acceptor Molecules

Donor Molecules

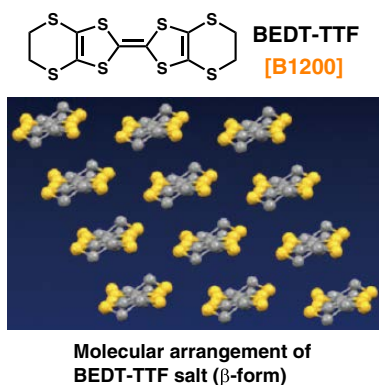
Electrocrystallization Supporting Electrolytes

Tetrathiafulvalene (TTF) Precursors

Molecular Conductors

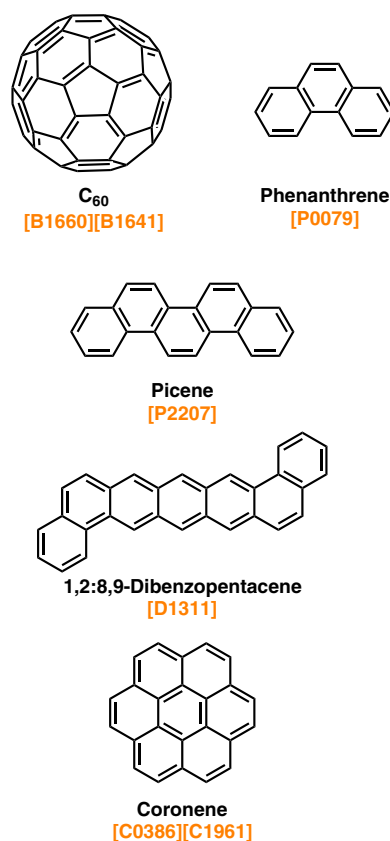
A molecular conductor is an electrical conductor based on a molecular component. A chemical modification of the molecule can control the electronic structure and physical properties. We can synthesize an opened-shell molecular conductor by chemical or electrochemical doping of a carrier, although an organic molecule is usually an insulator with a closed-shell structure. The first example of an organic conductor was observed from a bromine-doped perylene.¹⁾ After this observation, a molecular conductor based on tetrathiafulvalene (TTF) was reported in the 1970s,²⁾ and the first case of an organic molecular superconductor was observed from the organic salt of tetraselenafulvalene, (TMTSF)₂X in the 1980s.³⁾ These TTF and TMTSF salts form a one-dimensional or pseudo one-dimensional molecular arrangement. On the other hand, bis(ethylenedithio) tetrathiafulvalene (BEDT-TTF) favors forming a two-dimensional molecular arrangement, which is a relatively stable molecular metal toward temperature.⁴⁻⁶⁾

Conducting salts of TTF derivatives can be normally obtained by an electrochemical oxidation (electrocrystallization).⁷⁾ These TTF derivatives can function as donor molecules with a hole carrier. Metal dithiolene complexes (M(dmit)₂), 7,7,8,8-Tetracyanoquinodimethane (TCNQ) and fullerene (C₆₀) are acceptor molecules with an electron carrier. An M(dmit)₂ salt produced the first example of an acceptor-based organic superconductor.⁸⁾ Chemical modifications of the M(dmit)₂ salt produced plenty of those organic superconductors by changing the central metal atom and counter cation.⁹⁾



Several alkali-doped nanocarbon and nanographene compounds have shown superconductivity. It is well known that rubidium- and cesium-doped fullerenes have demonstrated superconductivity at more than 30 K.¹⁰⁾ Recently, superconductivity of Cs₃C₆₀ at 38 K was reported.¹¹⁾ Although the molecular conductors synthesized from TTF and M(dmit)₂ exhibit low-dimensional molecular arrangements, these fullerene salts can form three-dimensionality.¹²⁾ Kubozono *et al.* reported that an alkali-doped picene demonstrated superconductivity at 18 K.¹³⁾ This result indicates that one can observe superconductivity from a planar nanocarbon material as well. In addition to the picene-based superconductor, an alkali-doped phenanthrene ($T_c = 5$ K),¹⁴⁾ alkali-doped coronene ($T_c = 15$ K),¹⁵⁾ and alkali-doped 1,2:8,9-dibenzopentacene ($T_c = 33$ K)¹⁶⁾ have also shown superconductivity.

Superconducting materials by alkali metal doping

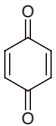
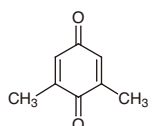
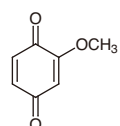
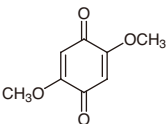
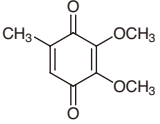
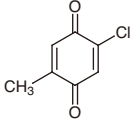
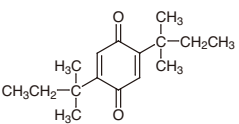
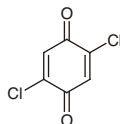
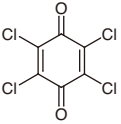
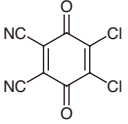
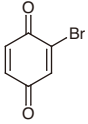
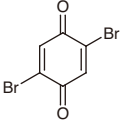
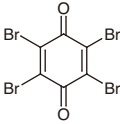
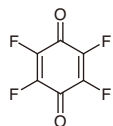
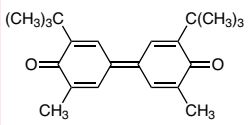
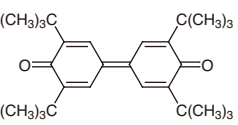
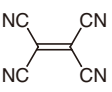
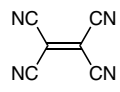
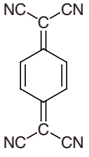
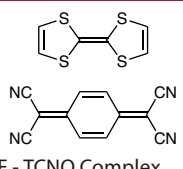
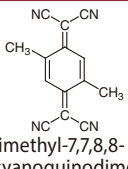
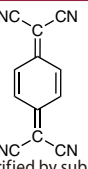
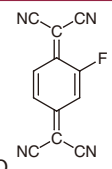
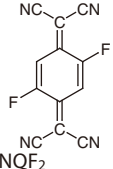
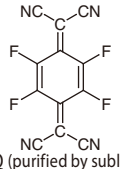
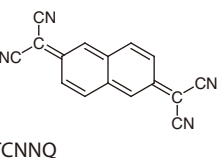
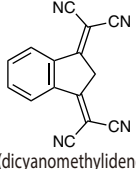
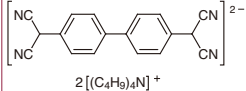


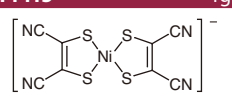
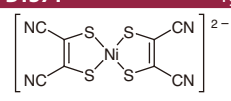
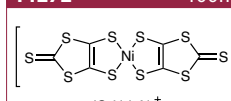
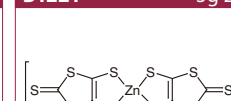
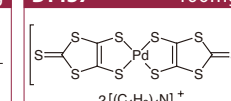
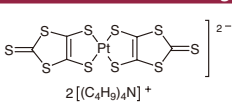
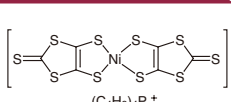
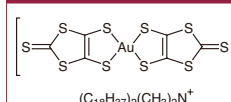
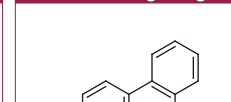
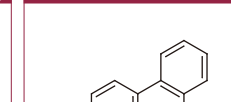
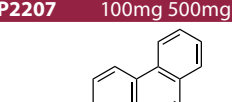
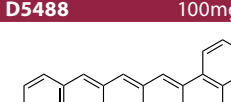
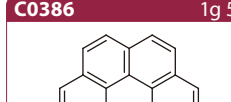
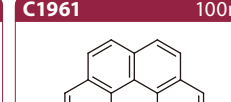

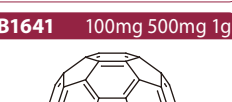

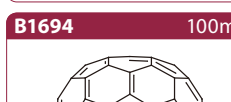
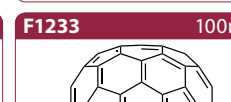
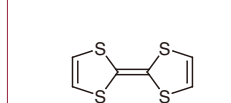
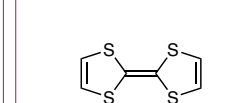
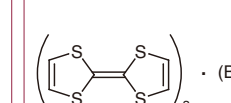
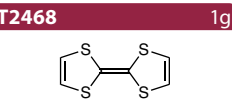
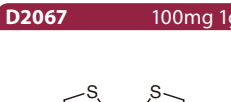
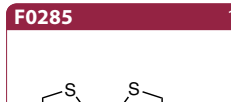
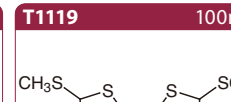
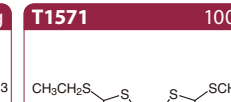
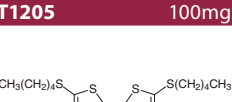
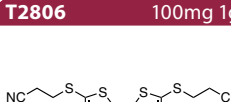
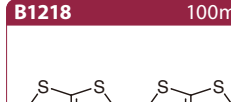
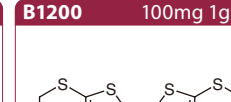
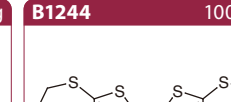



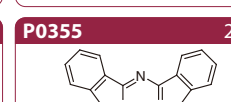
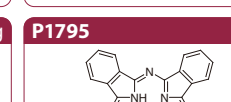
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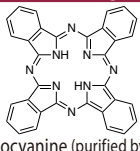
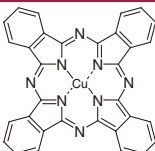
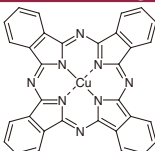
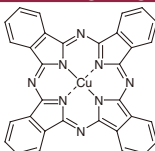
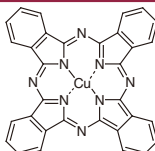
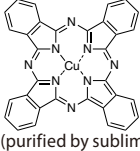
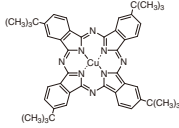
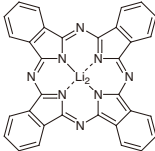
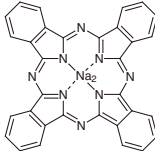
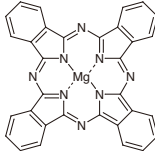
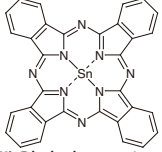
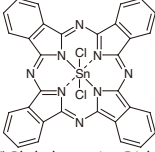
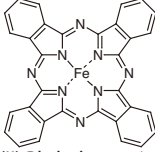
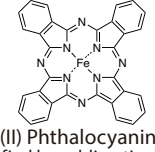
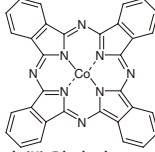
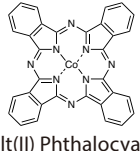
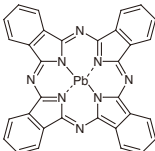
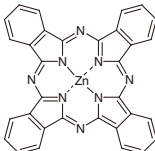
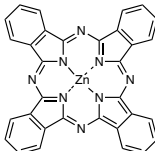
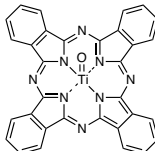
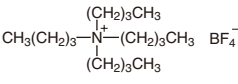
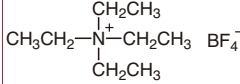
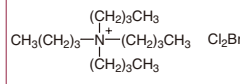
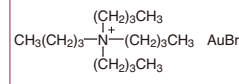
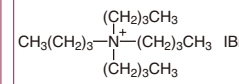
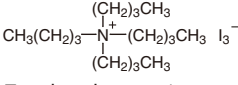
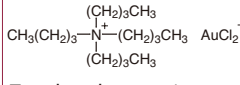
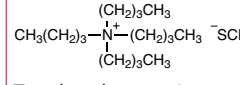
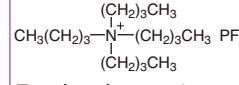
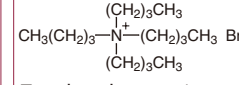
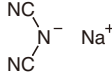
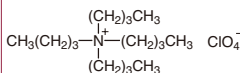
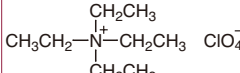
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Acceptor Molecules

B0089 25g 100g 500g	 1,4-Benzoquinone CAS RN: 106-51-4	D2234 1g 5g 25g	 2,6-Dimethyl-1,4-benzoquinone CAS RN: 527-61-7	M1045 1g 5g	 Methoxybenzoquinone CAS RN: 2880-58-2
D2250 5g 25g	 2,5-Dimethoxy-1,4-benzoquinone CAS RN: 3117-03-1	D1956 1g 5g	 2,3-Dimethoxy-5-methyl-1,4-benzoquinone CAS RN: 605-94-7	C1336 5g	 2-Chloro-5-methyl-1,4-benzoquinone CAS RN: 19832-87-2
D2152 5g	 2,5-Di-tert-amyloxy-1,4-benzoquinone CAS RN: 4584-63-8	D0343 1g 5g	 2,5-Dichloro-1,4-benzoquinone CAS RN: 615-93-0	T0061 25g 100g 500g	 Chloranil CAS RN: 118-75-2
D1070 5g 25g 250g	 DDQ CAS RN: 84-58-2	B1601 1g 5g	 2-Bromo-1,4-benzoquinone CAS RN: 3958-82-5	D2249 1g 5g	 2,5-Dibromo-1,4-benzoquinone CAS RN: 1633-14-3
T0617 5g 25g	 Bromanil CAS RN: 488-48-2	T0790 1g 5g	 Fluoranil CAS RN: 527-21-9	D4407 1g	 3,3'-Di-tert-butyl-5,5'-dimethyldiphenylquinone CAS RN: 2417-00-7
T1503 1g	 3,3',5,5'-Tetra-tert-butyl-4,4'-diphenylquinone CAS RN: 2455-14-3	T0077 5g 25g	 TCNE CAS RN: 670-54-2	T3264 1g 5g	 TCNE (purified by sublimation) CAS RN: 670-54-2
T0078 5g 25g	 TCNQ CAS RN: 1518-16-7	T2468 1g	 TTF - TCNQ Complex CAS RN: 40210-84-2	D2021 100mg 500mg	 2,5-Dimethyl-7,7,8,8-tetracyanoquinodimethane CAS RN: 1487-82-7
T3034 1g 5g	 TCNQ (purified by sublimation) CAS RN: 1518-16-7	D0509 100mg	 FTCNQ CAS RN: 69857-37-0	D3200 100mg	 2,5-TCNQF ₂ CAS RN: 73318-02-2
T1131 100mg 1g	 F ₄ TCNQ (purified by sublimation) CAS RN: 29261-33-4	T1246 100mg	 TCNNO CAS RN: 6251-01-0	B1416 1g 5g	 1,3-Bis(dicyanomethylidene)indan CAS RN: 38172-19-9
B1466 100mg	 Bis(tetrabutylammonium) Tetracyanodiphenylquinodimethane CAS RN: 68271-98-7				

<p>T1415 1g</p>  <p>(C₄H₉)₄N⁺ Tetrabutylammonium Bis(maleonitriledithiolato)-nickel(III) Complex CAS RN: 6251-01-0</p>	<p>B1371 1g</p>  <p>2[(C₄H₉)₄N]⁺ Bis(tetrabutylammonium) Bis(maleonitriledithiolato)-nickel(II) Complex CAS RN: 18958-57-1</p>	<p>T1272 100mg</p>  <p>(C₄H₉)₄N⁺ Tetrabutylammonium Bis(1,3-dithiole-2-thione-4,5-dithiolato)nickel(III) Complex CAS RN: 68401-88-7</p>	<p>B1221 5g 25g</p>  <p>2[(C₄H₉)₄N]⁺ BTBA-BDTD Zn Complex CAS RN: 68449-38-7</p>	<p>B1437 100mg 1g</p>  <p>2[(C₄H₉)₄N]⁺ Bis(tetrabutylammonium) Bis(1,3-dithiole-2-thione-4,5-dithiolato)palladium(II) Complex CAS RN: 72688-90-5</p>
<p>B1438 100mg</p>  <p>2[(C₄H₉)₄N]⁺ Bis(tetrabutylammonium) Bis(1,3-dithiole-2-thione-4,5-dithiolato)platinum(II) Complex CAS RN: 72688-91-6</p>	<p>T1416 1g</p>  <p>(C₄H₉)₄P⁺ Tetrabutylphosphonium Bis(1,3-dithiole-2-thione-4,5-dithiolato)nickel(III) Complex CAS RN: 105029-70-7</p>	<p>D2134 100mg</p>  <p>(C₁₈H₃₇)₂(CH₃)₂N⁺ Dioctadecyldimethylammonium Bis(1,3-dithiole-2-thione-4,5-dithiolato)aurate(III) Complex CAS RN: 120141-26-6</p>	<p>P0079 25g 100g 500g</p>  <p>Phenanthrene CAS RN: 85-01-8</p>	<p>P0331 1sample</p>  <p>Phenanthrene Zone Refined (number of passes:30) CAS RN: 85-01-8</p>
<p>P2207 100mg 500mg</p>  <p>Picene (purified by sublimation) (>99.9%) CAS RN: 213-46-7</p>	<p>D5488 100mg</p>  <p>Dibenzo[a,h]pentacene CAS RN: 227-09-8</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>B1660 100mg 1g</p>  <p>Fullerene C₆₀ CAS RN: 99685-96-8</p>
<p>B1641 100mg 500mg 1g</p>  <p>Fullerene C₆₀ (pure) CAS RN: 99685-96-8</p>	<p>F1232 100mg</p>  <p>Fullerene C₆₀ [for organic electronics] CAS RN: 99685-96-8</p>	<p>B1694 100mg</p>  <p>Fullerene C₇₀ CAS RN: 115383-22-7</p>	<p>F1233 100mg</p>  <p>Fullerene C₇₀ [for organic electronics] CAS RN: 115383-22-7</p>	
<p>Donor Molecules</p>				
		<p>T0980 1g 5g 25g</p>  <p>TTF CAS RN: 31366-25-3</p>	<p>T3380 200mg 1g</p>  <p>TTF (purified by sublimation) CAS RN: 31366-25-3</p>	<p>T1282 1g</p>  <p>Tetrathiafulvalene Fluoroborate CAS RN: 55492-86-9</p>
<p>T2468 1g</p>  <p>TTF-TCNQ Complex CAS RN: 40210-84-2</p>	<p>D2067 100mg 1g</p>  <p>SDM-TTF</p>	<p>F0285 1g</p>  <p>Formyl-TTF CAS RN: 68128-94-9</p>	<p>T1119 100mg</p>  <p>TMT-TTF CAS RN: 51501-77-0</p>	<p>T1571 100mg</p>  <p>TET-TTF CAS RN: 104515-79-9</p>
<p>T1205 100mg</p>  <p>TPT-TTF CAS RN: 106920-29-0</p>	<p>T2806 100mg 1g</p>  <p>2,3,6,7-Tetrakis(2-cyanoethylthio)tetrathiafulvalene CAS RN: 132765-36-7</p>	<p>B1218 100mg</p>  <p>BMDT-TTF CAS RN: 68550-20-9</p>	<p>B1200 100mg 1g 5g</p>  <p>BEDT-TTF CAS RN: 66946-48-3</p>	<p>B1244 100mg</p>  <p>BPDT-TTF CAS RN: 66946-49-4</p>
<p>P0078 5g 25g</p>  <p>Perylene CAS RN: 198-55-0</p>	<p>P1629 1g</p>  <p>Perylene (purified by sublimation) CAS RN: 198-55-0</p>	<p>T1221 5g 25g</p>  <p>TDAE CAS RN: 996-70-3</p>	<p>P0355 25g</p>  <p>Phthalocyanine CAS RN: 574-93-6</p>	<p>P1795 1g</p>  <p>Phthalocyanine (purified by sublimation) CAS RN: 574-93-6</p>

<p>P2734 100mg 500mg</p>  <p>Phthalocyanine (purified by sublimation) [for organic electronics] CAS RN: 574-93-6</p>	<p>P0655 25g</p>  <p>CuPc CAS RN: 147-14-8</p>	<p>P1005 25g 250g</p>  <p>CuPc (α-form) CAS RN: 147-14-8</p>	<p>P1006 25g 100g 500g</p>  <p>CuPc (β-form) CAS RN: 147-14-8</p>	<p>P1628 1g</p>  <p>CuPc (purified by sublimation) CAS RN: 147-14-8</p>
<p>C3645 100mg 500mg</p>  <p>CuPc (purified by sublimation) [for organic electronics] CAS RN: 147-14-8</p>	<p>T1256 100mg</p>  <p>Copper(II) 2,9,16,23-Tetra-<i>tert</i>-butylphthalocyanine CAS RN: 39001-64-4</p>	<p>P1049 1g 5g</p>  <p>Dilithium Phthalocyanine CAS RN: 25510-41-2</p>	<p>P0973 1g 5g</p>  <p>Disodium Phthalocyanine CAS RN: 25476-27-1</p>	<p>P1018 1g</p>  <p>Magnesium(II) Phthalocyanine CAS RN: 1661-03-6</p>
<p>P1024 1g 5g</p>  <p>Tin(II) Phthalocyanine CAS RN: 15304-57-1</p>	<p>P0997 1g</p>  <p>Tin(IV) Phthalocyanine Dichloride CAS RN: 18253-54-8</p>	<p>P0774 5g 25g</p>  <p>Iron(II) Phthalocyanine CAS RN: 132-16-1</p>	<p>I0783 200mg 1g</p>  <p>Iron(II) Phthalocyanine (purified by sublimation) CAS RN: 132-16-1</p>	<p>P0887 5g 25g</p>  <p>Cobalt(II) Phthalocyanine CAS RN: 3317-67-7</p>
<p>C3252 200mg</p>  <p>Cobalt(II) Phthalocyanine (purified by sublimation) CAS RN: 3317-67-7</p>	<p>P0766 1g 25g</p>  <p>Lead(II) Phthalocyanine CAS RN: 15187-16-3</p>	<p>P0767 1g 5g 25g</p>  <p>Zinc Phthalocyanine CAS RN: 14320-04-8</p>	<p>Z0037 500mg</p>  <p>ZnPc (purified by sublimation) CAS RN: 14320-04-8</p>	<p>T2272 200mg 1g</p>  <p>TiOPc (purified by sublimation) CAS RN: 26201-32-1</p>
<p>P0660 25g</p> <p>Pigment Green 7 CAS RN: 1328-53-6</p>				
<h2>Electrocrystallization Supporting Electrolytes</h2>				
<p>T0914 25g 100g 500g</p>  <p>Tetrabutylammonium Tetrafluoroborate CAS RN: 429-42-5</p>	<p>T0983 5g 25g</p>  <p>Tetraethylammonium Tetrafluoroborate CAS RN: 429-06-1</p>	<p>T1186 25g</p>  <p>Tetrabutylammonium Dichlorobromide CAS RN: 13053-75-3</p>	<p>T1261 1g</p>  <p>Tetrabutylammonium Dibromoaurate CAS RN: 50481-01-1</p>	<p>T1269 1g 10g</p>  <p>Tetrabutylammonium Dibromiodide CAS RN: 15802-00-3</p>
<p>T1271 5g 25g</p>  <p>Tetrabutylammonium Triiodide CAS RN: 13311-45-0</p>	<p>T1273 100mg</p>  <p>Tetrabutylammonium Dichloroaurate CAS RN: 50480-99-4</p>	<p>T1278 25g 250g</p>  <p>Tetrabutylammonium Thiocyanate CAS RN: 3674-54-2</p>	<p>T1279 25g 250g</p>  <p>Tetrabutylammonium Hexafluorophosphate CAS RN: 3109-63-5</p>	<p>T1284 25g 100g 500g</p>  <p>Tetrabutylammonium Tribromide CAS RN: 38932-80-8</p>
<p>S0838 25g 100g</p>  <p>Sodium Dicyanamide CAS RN: 1934-75-4</p>	<p>T0836 25g 100g 500g</p>  <p>Tetrabutylammonium Perchlorate CAS RN: 1923-70-2</p>	<p>T0839 25g</p>  <p>Tetraethylammonium Perchlorate CAS RN: 2567-83-1</p>		

<p>T1357 100mg 1g</p> <p>Tetrabutylammonium Diiodoaurate</p>	<p>T1803 1g 5g</p> <p>Tetrabutylammonium Perrhenate CAS RN: 16385-59-4</p>	<p>T2648 25g</p> <p>Tetrabutylammonium Tetrafluoroborate CAS RN: 429-42-5</p>		
<h2 style="margin: 0;">Tetrathiafulvalene (TTF) Precursors</h2>				
	<p>B1151 5g</p> <p>1,3-Benzodithiolium Tetrafluoroborate CAS RN: 57842-27-0</p>	<p>B1199 1g 5g</p> <p>4,5-Bis(benzoylthio)- 1,3-dithiole-2-thione CAS RN: 68494-08-6</p>	<p>B1272 1g</p> <p>Bis(carbonyldithio)- tetrathiafulvalene CAS RN: 64394-47-4</p>	
<p>B1777 1g</p> <p>4,5-Bis(methylthio)- 1,3-dithiol-2-one CAS RN: 61485-46-9</p>	<p>B1778 1g</p> <p>4,5-Bis(methylthio)- 1,3-dithiole-2-thione CAS RN: 49638-64-4</p>	<p>B2228 1g</p> <p>4,5-Bis(2-cyanoethylthio)- 1,3-dithiole-2-thione CAS RN: 132765-35-6</p>	<p>B2233 1g</p> <p>4,5-Bis(2-cyanoethylthio)- 1,3-dithiol-2-one CAS RN: 158871-28-4</p>	<p>D2127 10g 25g</p> <p>Dimethyl 1,3-Dithiole- 2-thione-4,5-dicarboxylate CAS RN: 7396-41-0</p>
<p>D2133 1g 5g</p> <p>1,3-Dithiole-2-thione CAS RN: 930-35-8</p>	<p>D3252 1g</p> <p>4,5-Dicyano-1,3-dithiol-2-one CAS RN: 934-31-6</p>	<p>D3981 1g 5g</p> <p>Dimethyl 2-(1,3-Dithiole)- phosphonate CAS RN: 133113-76-5</p>	<p>D3992 1g</p> <p>Dimethyl 1,3-Benzodithiol- 2-ylphosphonate CAS RN: 62217-35-0</p>	<p>E0429 1g 5g 25g</p> <p>4,5-Ethylenedithio- 1,3-dithiole-2-thione CAS RN: 59089-89-3</p>
<p>E0460 1g 5g</p> <p>4,5-Ethylenedithio- 1,3-dithiol-2-one CAS RN: 74962-29-1</p>	<p>H1163 1g</p> <p>5-Hexyl-1,3-dithiole[4,5-<i>d</i>]- [1,3]dithiole-2-thione CAS RN: 202126-51-0</p>	<p>M1112 1g</p> <p>4,5-Methylenedithio- 1,3-dithiole-2-thione CAS RN: 70800-59-8</p>	<p>M1154 100mg</p> <p>4,5-Methylenedithio- 1,3-dithiol-2-one CAS RN: 85720-62-3</p>	<p>P1635 250mg 1g</p> <p>5-Propyl-1,3-dithiole[4,5-<i>d</i>]- [1,3]dithiole-2-thione CAS RN: 202126-48-5</p>
<p>T0266 1g 5g 25g</p> <p>Toluene-3,4-dithiol CAS RN: 496-74-2</p>	<p>T0279 1g 5g</p> <p>Zinc Dithiol CAS RN: 29726-21-4</p>	<p>T1132 1g 5g 25g</p> <p>1,3,4,6-Tetrathiapentalene- 2,5-dione CAS RN: 64394-45-2</p>		

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