

**Materials for:** Proton Exchange Membrane Fuel Cells (PEM FC)  
Direct Methanol Fuel Cells (DMFC)  
Phosphoric Acid Fuel Cells (PAFC)

Product name	Formula	CAS #	STREM Catalog #
<b>CATALYSTS</b>			
Platinum black, min. 97%	Pt	7440-06-4	78-1420
Platinum, 97% (2-5 nanometers)	Pt	7440-06-4	78-0007
<b>CATALYST PRECURSORS</b>			
<b>Nanoparticles</b>			
Platinum colloid (polyethyleneglycol-dodecylether hydrosol) (~10 wt% Pt), 1.2 nm ± 0.3	Pt/alkoxyethers		78-0011
Platinum Nanoparticles [PtNP: 2-3 nm (gum Arabic)], yellowish-brown liq.			78-0405
Platinum-ruthenium colloid (polyethyleneglycol-dodecylether hydrosol), 1.3 nm (average)	Pt <sub>50</sub> Ru <sub>50</sub> /alkoxyethers		78-0060
Platinum-ruthenium/tetra-n-octylammonium chloride colloid (~7 wt% Pt, ~3.5 wt% Ru),	Pt <sub>50</sub> Ru <sub>50</sub> /(C <sub>8</sub> H <sub>17</sub> ) <sub>4</sub> NCl		78-0062
Platinum/tetra-n-octylammonium chloride colloid, purified (70-85% Pt)	Pt/(C <sub>8</sub> H <sub>17</sub> ) <sub>4</sub> NCl		78-0055
<b>Organometallic Platinum Nanoparticle Precursors</b>			
Ammonium hexachloroplatinate(IV), 99%	(NH <sub>4</sub> ) <sub>2</sub> PtCl <sub>6</sub>	16919-58-7	93-7801
Chloroplatinic acid hexahydrate (38-40% Pt) (99.9%-Pt)	H <sub>2</sub> PtCl <sub>6</sub> ·6H <sub>2</sub> O	16941-12-1	78-0200
Dihydrogen hexahydroxyplatinate(IV), 99%	H <sub>2</sub> Pt(OH) <sub>6</sub>	51850-20-5	93-7806
Dimethyl(1,5-cyclooctadiene)platinum(II), 99%	(CH <sub>3</sub> ) <sub>2</sub> Pt(C <sub>8</sub> H <sub>12</sub> )	12266-92-1	78-0700
Platinum(II) acetylacetonate, 98%	Pt(CH <sub>3</sub> COCHCOCH <sub>3</sub> ) <sub>2</sub>	15170-57-7	78-1400
Platinum(II) hexafluoroacetylacetonate, 98% (99.9%-Pt)	Pt(CF <sub>3</sub> COCHCOCF <sub>3</sub> ) <sub>2</sub>	65353-51-7	78-1550
Tris(dibenzylideneacetone)diplatinum(0), min. 98%	(C <sub>6</sub> H <sub>5</sub> CH=CHCOCH=CHC <sub>6</sub> H <sub>5</sub> ) <sub>3</sub>	63782-74-1	78-1365
<b>Platinum Nanoparticle Precursors</b>			
Platinum(II) bromide, 98%	PtBr <sub>2</sub>	13455-12-4	78-1429
Platinum(II) chloride (99.9%-Pt)	PtCl <sub>2</sub>	10025-65-7	78-1480
Platinum(IV) chloride (99.9%-Pt)	PtCl <sub>4</sub>	13454-96-1	78-1490
Platinum(II) iodide, min. 98%	PtI <sub>2</sub>	7790-39-8	93-7808
Potassium hexabromoplatinate(IV), 99%	K <sub>2</sub> PtBr <sub>6</sub>	16920-93-7	78-1950
Potassium hexachloroplatinate(IV), 99%	K <sub>2</sub> PtCl <sub>6</sub>	16921-30-5	78-1960
Potassium hexacyanoplatinate(IV), 99%	K <sub>2</sub> Pt(CN) <sub>6</sub>	16920-94-8	78-1963
Potassium tetrabromoplatinate(II), 99%	K <sub>2</sub> PtBr <sub>4</sub>	13826-94-3	78-1967
Potassium tetrachloroplatinate(II) (99.9%-Pt)	K <sub>2</sub> PtCl <sub>4</sub>	10025-99-7	78-1970
Sodium hexachloroplatinate(IV) hexahydrate, 98+%	Na <sub>2</sub> PtCl <sub>6</sub> ·6H <sub>2</sub> O	19583-77-8	78-1995
Sodium tetrachloroplatinate(II) hydrate	Na <sub>2</sub> PtCl <sub>4</sub> ·XH <sub>2</sub> O	207683-21-4	93-7810
Tetraammineplatinum(II) chloride monohydrate, 99% (99.95%-Pt)	[Pt(NH <sub>3</sub> ) <sub>4</sub> ]Cl <sub>2</sub> ·H <sub>2</sub> O	13933-32-9	78-2000
Tetraammineplatinum(II) hydroxide hydrate (59% Pt)	Pt(NH <sub>3</sub> ) <sub>4</sub> (OH) <sub>2</sub> ·XH <sub>2</sub> O	15651-37-3	78-2005
Tetraammineplatinum(II) nitrate, 99%	[Pt(NH <sub>3</sub> ) <sub>4</sub> ](NO <sub>3</sub> ) <sub>2</sub>	20634-12-2	78-2010
Tetraammineplatinum(II) tetrachloroplatinate(II), 99%	[Pt(NH <sub>3</sub> ) <sub>4</sub> ][PtCl <sub>4</sub> ]	13820-46-7	78-2015

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**CATALYST PRECURSORS (cont.)****Ruthenium Nanoparticle Precursors**

Potassium hexacyanoruthenate(II) hydrate	$K_4Ru(CN)_6 \cdot XH_2O$	15002-31-0	44-1700
Potassium pentachlororuthenate(III) hydrate	$K_2RuCl_5 \cdot XH_2O$	14404-33-2	93-1987
Potassium perruthenate, 98%	$KRuO_4$	10378-50-4	44-1750
Ruthenium(III) acetylacetonate, 99%	$Ru(CH_3COCHCOCH_3)_3$	14284-93-6	44-1800
Ruthenium(III) bromide hydrate	$RuBr_3 \cdot XH_2O$	14014-88-1	44-1825
Ruthenium(III) chloride, anhydrous	$RuCl_3$	10049-08-8	44-5850
Ruthenium(III) chloride hydrate (40-43% Ru) (99.9%-Ru)	$RuCl_3 \cdot XH_2O$	14898-67-0	44-5880
Ruthenium(III) iodide, anhydrous, 98+%	$RuI_3$	13896-65-6	44-2500

**CATALYST MODIFIERS****Copper Compounds**

Copper(II) acetylacetonate, 98+%	$Cu(CH_3COCHCOCH_3)_2$	13395-16-9	93-2968
Copper(II) ethylacetoacetate, 99%	$Cu(CH_3COCHCOC_2H_5)_2$	14284-06-1	93-2920
Copper(II) 2-ethylhexanoate (solvent free - 16-19% Cu)	$Cu[OOCCH(C_2H_5)C_4H_9]_2$	149-11-1	29-2941
Copper(II) hexafluoroacetylacetonate, anhydrous, elec. gr. (99.99+%-Cu) PURATREM	$Cu(CF_3COCHCOCF_3)_2$	14781-45-4	29-2928
Copper(II) hexafluoroacetylacetonate hydrate, elec. gr. (99.99+%-Cu) PURATREM	$Cu(CF_3COCHCOCF_3)_2 \cdot XH_2O$	14781-45-4	29-2929
Copper(II) nitrate trihydrate, 99.5%	$Cu(NO_3)_2 \cdot 3H_2O$	10031-43-3	93-2939
Copper(II) nitrate trihydrate (99.999%-Cu) PURATREM	$Cu(NO_3)_2 \cdot 3H_2O$	10031-43-3	93-2940

**Cobalt Compounds**

Cobalt(II) acetylacetonate hydrate	$Co(CH_3COCHCOCH_3)_2 \cdot XH_2O$	123334-29-2	93-2703
Cobalt carbonyl (Dicobalt octacarbonyl)	$Co_2(CO)_8$	10210-68-1	27-0400
Cobalt(II) acetylacetonate hydrate	$Co(CH_3COCHCOCH_3)_2 \cdot XH_2O$	123334-29-2	93-2703
Cobalt(II) nitrate hexahydrate, 99%	$Co(NO_3)_2 \cdot 6H_2O$	10026-22-9	93-2730
Cobalt(II) nitrate hexahydrate (99.999%-Co) PURATREM	$Co(NO_3)_2 \cdot 6H_2O$	10026-22-9	93-2746

**Nickel Compounds**

Bis(1,5-cyclooctadiene)nickel (0), 98+%	$(1,5-C_8H_{12})_2Ni$	1295-35-8	28-0010
Nickel(II) hexafluoroacetylacetonate hydrate, 98%	$Ni(CF_3COCHCOCF_3)_2 \cdot XH_2O$	14949-69-0	93-2821
Nickel(II) nitrate hexahydrate (99.9+%-Ni)	$Ni(NO_3)_2 \cdot 6H_2O$	13478-00-7	93-2860
Nickel(II) nitrate hexahydrate (99.9985%-Ni) PURATREM	$Ni(NO_3)_2 \cdot 6H_2O$	13478-00-7	28-1440

**MEMBRANE MATERIALS**

Vinylphosphonic acid, min. 90%	$CH_2=CHP(O)(OH)_2$	1746-03-8	15-9155
Vinylphosphonic acid dimethyl ester, min. 90%	$CH_2=CHP(O)(OCH_3)_2$	4645-32-3	15-9158

**CATALYST SUPPORTS**

Activated carbon; black powder	C	7440-44-0	06-0100
Activated carbon; 4 x 10 mesh black gran.	C	7440-44-0	06-0050
Carbon nanodiscs/nanocones (annealed); black powdr.		7440-44-0	06-0725
Carbon nanotube array, multi-walled, on quartz (diameter= 100nm, length=30 microns )		1333-86-4	06-0440
Carbon nanotubes, multi-walled (diameter = ~140nm, length = ~7 microns) (>90% nanotubes)		1333-86-4	06-0470

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**CATALYST SUPPORTS (cont.)**

Carbon nanotubes, multi-walled (diameter = ~20-25nm, length = ~1-5 microns) (85% nanotubes)		1333-86-4	06-0475
Carbon nanotubes, multi-walled, arc-produced (diameter = 2-50nm, length = >2 microns) (55-65wt% nanotubes)		308068-56-6	06-0720
Carbon nanotubes, multi-walled, as produced cathode deposit		1333-86-4	06-0504
Carbon nanotubes, multi-walled, core material		1333-86-4	06-0505
Carbon nanotubes, multi-walled, ground core material		1333-86-4	06-0506
Carbon nanotubes, single-walled pwdr.		308068-56-6	06-0508
Carbon powder (99+%); -325 mesh pwdr.		7440-44-0	93-0601
Carbon powder (99.999%); -200 mesh pwdr.		7440-44-0	93-0602
Carbon, Stacked Graphene Platelet Nanofibers (acid washed) SGNF			06-0170
Carbon, Stacked Graphene Platelet Nanochips (SGNF heat treated)			06-0172
Graphene nanoplatelets (6-8 nm thick x 5 microns wide); black platelet			06-0210
Graphene nanoplatelets (6-8 nm thick x 15 microns wide); black platelet			06-0215
Graphene nanoplatelets (6-8 nm thick x 25 microns wide); black platelet			06-0220
Graphene nanoplatelets aggregates (sub-micron particles, surface area 300m <sup>2</sup> /g); black platelet			06-0225
Graphene nanoplatelets aggregates (sub-micron particles, surface area 500m <sup>2</sup> /g); black platelet			06-0230
Graphene nanoplatelets aggregates (sub-micron particles, surface area 750m <sup>2</sup> /g); black platelet			06-0235

**MATERIALS FOR SOLID OXIDE FUEL CELLS**

Nickel(II) oxide (99.99%-Ni)	NiO	1313-99-1	93-2833
Nickel(II) oxide (99.998%-Ni)	NiO	1313-99-1	28-1475
Vanadium(V) oxide 99.99% trace metals basis	V <sub>2</sub> O <sub>5</sub>	1314-62-1	93-2337

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