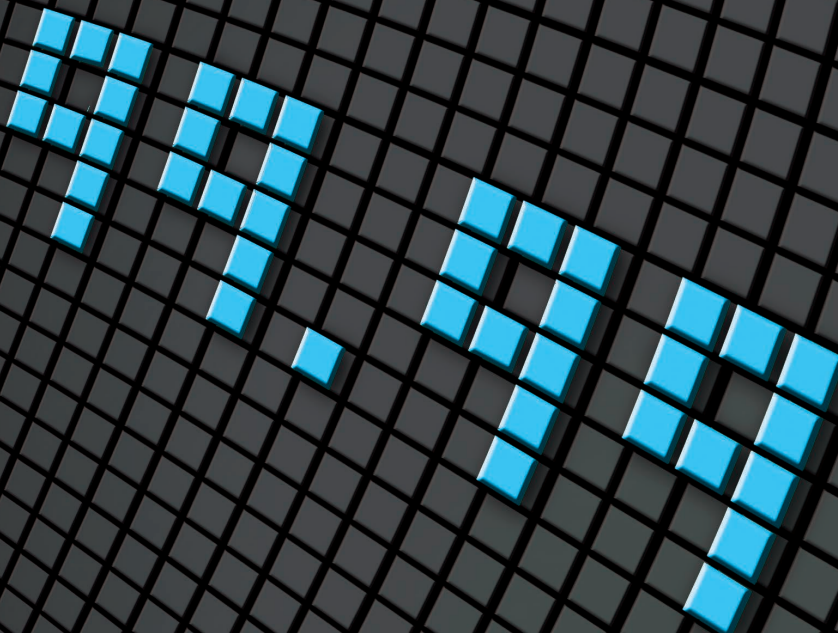


PURATREM™

High Purity Inorganics



Metals Purity – 99.99% and higher



STREM

PURATREM™ - High Purity Inorganics



Strem Chemicals, Inc. has been providing fine chemicals for research and development as well as commercial production for over fifty years. In 1988 we officially launched the "PURATREM - High Purity Inorganics" line. Each of the products presented in this booklet has a minimum purity of 99.99% (metals basis). Many of these items can be used as CVD/ALD precursors, where the product purity can play an integral part in the application results.

At Strem, we also offer a wide variety of catalysts, ligands and nanomaterials. Most of our products are

of high purity, typically at 99%, while some are as high as 99.9999% metals purity. As an effort to expand our product line, we continually seek to provide new technologies from around the globe. We have licensing agreements with industry and academia, which allow easier access to these patent-protected products for our customers. We look forward to continued growth in order to best serve our customers' needs with the quality and service they can trust from Strem.

As part of our ongoing commitment to quality, we have achieved ISO 9001 certification for the Quality Management System (QMS) at our corporate headquarters in Newburyport, Massachusetts.

In addition, custom synthesis services are provided on a contract basis. For pharmaceutical applications, manufacturing is conducted under current Good Manufacturing Practices (cGMP) in FDA inspected kilo-lab suites. Complete documentation is available, including validation and stability studies. Active Drug Master Files (DMF's) are maintained in North America and Europe.

Our other booklets, which focus on applications and product classes, are available in print per request and also as PDFs on our website. Below is a list of current booklet titles that are available. Please also check our Product Resources section online to find additional literature offerings, such as The Strem Chemiker, our technical publication, and product literature sheets.

- Biocatalysts
- Buchwald Ligands and Precatalysts
- Carbon-Base Nanomaterials & Elemental Forms
- Catalysts & Ligands Manufactured Under License of Takasago Patent
- Gold Elements & Compounds
- Heterogeneous Catalysts
- High Purity Chiral Reagents
- Kits
- Materials for Energy Applications
- Metal Catalysts for Organic Synthesis
- Metathesis Catalysts
- MOCVD, CVD & ALD Precursors
- MOFs and Ligands for MOF Synthesis
- Nanomaterials
- New Products
- Other Ligands
- Phosphorous Ligands and Compounds
- Photocatalysts
- PURATREM: High Purity Inorganics

Ephraim S. Honig, Ph.D., M.B.A.
Chief Executive Officer



PURATREM 07/18
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Glossary of Terms

[α]_D		Specific rotation
AAS		Atomic Absorption Standard
ACS		Conforms to American Chemical Society specifications
air sensitive	.....	Product may chemically react with atmospheric oxygen or carbon dioxide at ambient conditions. Handle and store under an inert atmosphere of nitrogen or argon.
amp	.....	Ampouled
b.p.	.....	Boiling point in °C at 760mm, unless otherwise noted
d.	.....	Density
dec.	.....	Decomposes
elec. gr.	.....	Electronic Grade, suitable for electronic applications
f.p.	.....	Flash point in °F
gran.	.....	Granular
heat sensitive	.....	Product may chemically degrade if stored for prolonged periods of time at ambient temperatures or higher. Store at 5°C or lower.
hydrate	.....	Unspecified water content which may vary slightly from lot to lot
hygroscopic	.....	Product may absorb water if exposed to the atmosphere for prolonged periods of time (dependent on humidity and temperature). Handle and store under an inert atmosphere of nitrogen or argon.
light sensitive	.....	Product may chemically degrade if exposed to light
liq.	.....	Liquid
m.p.	.....	Melting point in °C
moisture sensitive	.....	Product may chemically react with water. Handle and store under an inert atmosphere of nitrogen or argon.
NMR grade	.....	Suitable as a Nuclear Magnetic Resonance reference standard
optical grade	.....	For optical applications
powdr.	.....	Powder
primary standard	.....	Used to prepare reference standards and standardize volumetric solutions
PURATREM	.....	Product has a minimum purity of 99.99% (metals basis)
purified	.....	A grade higher than technical, often used where there are no official standards
P. Vol.	.....	Pore volume
pyrophoric	.....	Product may spontaneously ignite if exposed to air at ambient conditions
reagent	.....	High purity material, generally used in the laboratory for detecting, measuring, examining or analyzing other substances
REO	.....	Rare Earth Oxides. Purity of a specific rare-earth metal expressed as a percentage of total rare-earths oxides.
SA	.....	Surface area
store cold	.....	Product should be stored at -18°C or 4°C, unless otherwise noted (see product details)
subl.	.....	Sublimes
superconductor grade	.....	A high purity, analyzed grade, suitable for preparing superconductors
tech. gr.	.....	Technical grade for general industrial use
TLC	.....	Suitable for Thin Layer Chromatography
v.p.	.....	Vapor pressure mm of Hg
xtl.	.....	Crystalline

About Purity

Chemical purity	.....	is reported after the chemical name, e.g. Ruthenium carbonyl, 99%
Metals purity	.....	is reported in parentheses with the respective element, e.g. Gallium (III) bromide, anhydrous, granular (99.999%-Ga) PURATREM where 100% minus the metal purity is equal to the maximum allowable percentage of trace metal impurity

ALUMINUM (Compounds)

13-0050 HAZ	Aluminum chloride, anhydrous (99.99%-Al) PURATREM (7446-70-0) AlCl ₃ ; FW: 133.34; -20 mesh white to yellow powdr.; m.p. 190°; b.p. 180° subl.; d. 2.44 <i>moisture sensitive</i>	50g 250g
13-1309 HAZ	Aluminum chloride hexahydrate (99.999%-Al) PURATREM (7784-13-6) AlCl ₃ ·6H ₂ O; FW: 133.34 (241.43); white xtl.; m.p. 100° dec.; d. 2.398 <i>hygroscopic</i>	25g 100g
13-1310 HAZ	Aluminum chloride hexahydrate (99.9995%-Al) PURATREM (7784-13-6) AlCl ₃ ·6H ₂ O; FW: 133.34 (241.43); white xtl.; m.p. 100° dec.; d. 2.398 <i>hygroscopic</i>	25g 100g
13-1300	Aluminum oxide (99.999%-Al) PURATREM (1344-28-1) Al ₂ O ₃ ; FW: 101.96; white powdr.; b.p. 2980°; d. 3.97	10g 50g
97-0139 HAZ	Aluminum i-propoxide (99.99%-Al) PURATREM (555-31-7) Al[(OCH(CH ₃) ₂) ₃]; FW: 204.25; white powdr.; m.p. 118.5°; b.p. 140.5°/8 mm; d. 1.0346 <i>moisture sensitive</i>	25g 100g
13-1600 HAZ	Dimethylaluminum i-propoxide, 98% (99.99%-Al) PURATREM (6063-89-4) (CH ₃) ₂ Al(OC ₃ H ₇); FW: 116.14; colorless liq.; d. 0.824 <i>air sensitive, moisture sensitive</i>	1g 5g

Technical Note:

- Useful starting material for the atomic layer deposition of Al₂O₃ films.

References:

- J. Vac. Sci. Tech. A., **2003**, 21, 1366

98-1855 HAZ 	Triethylaluminum, elec. gr. (99.999%-Al) PURATREM (97-93-8) (C ₂ H ₅) ₃ Al; FW: 114.17; colorless liq.; m.p. -52.5°; b.p. 186°; f.p. -1°F; d. 0.835 <i>moisture sensitive, pyrophoric</i>	100g
98-1955 HAZ 	Trimethylaluminum, elec. gr. (99.999%-Al) PURATREM (75-24-1) (CH ₃) ₃ Al; FW: 72.09; colorless liq.; m.p. 15.4°; b.p. 20°/8 mm; f.p. 1.4°F; d. 0.752 (20°) <i>moisture sensitive, pyrophoric</i> Note: Available prepacked in ALD cylinder- see 98-4007, 98-4008.	25g 100g 200g
98-4008 HAZ 	Trimethylaluminum, elec. gr. (99.999%-Al) PURATREM 98-1955, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (75-24-1) (CH ₃) ₃ Al; FW: 72.09; colorless liq.; m.p. 15.4°; b.p. 20°/8 mm; f.p. 1.4°F; d. 0.752 (20°) <i>moisture sensitive, pyrophoric</i>	25g
98-4007 HAZ 	Trimethylaluminum, elec. gr. (99.999%-Al) PURATREM, 98-1955, contained in 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (75-24-1) (CH ₃) ₃ Al; FW: 72.09; colorless liq.; m.p. 15.4°; b.p. 20°/8mm; f.p. 1.4°F; d. 0.752 (20°) <i>moisture sensitive, pyrophoric</i>	25g

AMMONIUM (Compounds)

93-0242	Ammonium chloride (99.999%) PURATREM (12125-02-9) NH ₄ Cl; FW: 53.49; white xtl.; m.p. 340° subl.; b.p. 520°; d. 1.527	25g 100g
02-0500	Ammonium dihydrogen phosphate (99.998%) PURATREM (7722-76-1) NH ₄ H ₂ PO ₄ ; FW: 115.03; white powdr.; m.p. 190°; d. 1.803	10g 50g
02-0590	Ammonium hexachlororhodate(III) monohydrate (99.995%-Rh) PURATREM (15336-18-2) (NH ₄) ₃ RhCl ₆ ·H ₂ O; FW: 369.74 (387.76); red xtl. <i>hygroscopic</i>	1g 5g
93-0214	Ammonium iodide (99.999%) PURATREM (12027-06-4) NH ₄ I; FW: 144.94; white xtl.; m.p. 551° subl.; d. 2.514	5g 25g
02-0700 HAZ	Ammonium metavanadate (99.995%-V) PURATREM (7803-55-6) NH ₄ VO ₃ ; FW: 116.98; white powdr.; m.p. 200° dec.; d. 2.33	5g
02-0750	Ammonium molybdate tetrahydrate (99.999%-Mo) PURATREM (12027-67-7) (NH ₄) ₆ Mo ₇ O ₂₄ ·4H ₂ O; FW: 1163.80 (1235.86); white xtl.; d. 2.498	5g 25g
02-0900 HAZ	Ammonium perrhenate (99.999%-Re) PURATREM (13598-65-7) NH ₄ ReO ₄ ; FW: 268.24; white powdr.; m.p. dec.; d. 3.97	1g 5g
02-1000	Ammonium tetrachloroaurate(III) hydrate (99.9985%-Au) PURATREM (13874-04-9) NH ₄ AuCl ₄ ·XH ₂ O; FW: 356.82; yellow xtl.	1g 5g

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AMMONIUM (Compounds)

02-1275	Ammonium tetrachloropalladate(II) (99.998%-Pd) PURATREM (13820-40-1) (NH ₄) ₂ PdCl ₄ ; FW: 284.29; red to brown powdr.; m.p. dec.; d. 2.17	1g 5g
42-1000	Ammonium tetrathiomolybdate(VI), 99% (99.99%-Mo) PURATREM (15060-55-6) (NH ₄) ₂ MoS ₄ ; FW: 260.27; red-green xtl. <i>air sensitive, (store cold)</i>	5g 25g
93-0250	Ammonium tungstate pentahydrate (99.996%-W) PURATREM (1311-93-9) (NH ₄) ₁₀ W ₁₂ O ₄₁ ·5H ₂ O; FW: 3042.56 (3132.63); white xtl.	10g 50g

ANTIMONY (Compounds)

97-0373 amp HAZ	Antimony(III) chloride, elec. gr. (99.999%-Sb) PURATREM (10025-91-9) SbCl ₃ ; FW: 228.11; off-white xtl.; m.p. 73.4°; b.p. 283°; d. 3.140 <i>moisture sensitive</i>	5g 25g
51-2200 amp HAZ	Antimony(V) chloride, (99.999%-Sb) PURATREM (7647-18-9) SbCl ₅ ; FW: 299.02; yellow liq.; m.p. 2.8°; b.p. 79°/22mm; d. 2.336 <i>moisture sensitive</i>	5g 25g
97-0380 HAZ	Antimony(III) oxide, elec. gr. (99.999%-Sb) PURATREM (1309-64-4) Sb ₂ O ₃ ; FW: 291.50; white powdr.; m.p. 656°; b.p. 1550° subl.; d. 5.67	25g 100g
51-5110 HAZ	Antimony(IV) oxide (99.99%-Sb) PURATREM (1332-81-6) Sb ₂ O ₄ ; FW: 307.50; white to off-white powdr.; d. 5.82	5g 25g
97-0382 HAZ	Antimony(V) oxide, elec. gr. (99.998%-Sb) PURATREM (1314-60-9) Sb ₂ O ₅ ; FW: 323.50; white to light yellow powdr.; d. 3.80	5g 25g 100g
93-5120 HAZ	Antimony(III) sulfide (99.999%-Sb) PURATREM (1345-04-6) Sb ₂ S ₃ ; FW: 339.68; black powdr.; m.p. 550°; b.p. ~1150°; d. 4.12	10g 50g
51-5000 HAZ	Tris(dimethylamino)antimony (99.99%-Sb) PURATREM (7289-92-1) ((CH ₃) ₂ N) ₃ Sb; FW: 253.99; colorless liq.; b.p. 32-34°/0.45mm; d. 1.325 <i>air sensitive, moisture sensitive</i>	1g 5g 25g

ARSENIC (Compounds)

93-3309 amp HAZ 	Arsenic(III) chloride (99.999%-As) PURATREM (7784-34-1) AsCl ₃ ; FW: 181.27; colorless liq.; m.p. -8.5°; b.p. 130.2°; d. 2.163 <i>moisture sensitive</i>	5g 25g 100g
97-0425 HAZ	Arsenic(III) oxide, elec. gr. (99.999%-As) PURATREM (1327-53-3) As ₂ O ₃ ; FW: 197.84; white powdr.; m.p. 315°; b.p. 465° subl.; d. 3.738	5g 25g 100g
93-3305	Arsenic(III) selenide (99.999%-As) PURATREM (1303-36-2) As ₂ Se ₃ ; FW: 386.72; black xtl.; m.p. ~360°; d. 4.75	5g 25g
33-1199 HAZ	Arsenic(III) sulfide, fused lumps (99.999%-As) PURATREM (1303-33-9) As ₂ S ₃ ; FW: 246.03; fused lumps; m.p. 300°; b.p. 707°; d. 3.43 <i>moisture sensitive</i>	10g 50g
98-1975 amp HAZ	Trimethylarsine, elec. gr. (99.995%-As) PURATREM (593-88-4) (CH ₃) ₃ As; FW: 120.03; colorless liq.; m.p. -87.3°; b.p. 51°; f.p. 100°F; d. 1.124 <i>air sensitive</i>	25g

BARIUM (Compounds)

56-5656	Barium bis(N,N,N',N',N"-pentamethyldiethylenetriamine)bis[BREW] (99.99+%-Ba) PURATREM Ba(C ₉ H ₂₃ N ₃) ₂ [C _x H _y C(O)CHC(O)C _x H ₁₂] (x=3-4, y=2x+1); pale yellow liq. <i>moisture sensitive</i> Note: 13-16 wt% Ba; ***Limited quantities available. Will discontinue when stock gone***	1g 5g 25g
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Technical Note:

1. H-BREW is a mixture of propyl and butyl substituted beta-diketonates capable of forming a wide variety of metal complexes suitable for MOCVD. In most cases, the metal complexes are liquids, are completely miscible with polar and non-polar organic solvents and are miscible with other metal complexes in essentially all proportions.

56-1025 HAZ	Barium carbonate (99.999%-Ba) PURATREM (513-77-9) BaCO ₃ ; FW: 197.35; white powdr.; d. 4.43	10g 50g
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BARIUM (Compounds)

56-1030 HAZ	Barium chloride dihydrate (99.999%-Ba) PURATREM (10326-27-9) BaCl ₂ ·2H ₂ O; FW: 208.24 (244.28); white xtl.; d. 3.097	10g 50g
93-5613 HAZ	Barium fluoride (99.99+%-Ba) PURATREM (7787-32-8) BaF ₂ ; FW: 175.34; white powdr.; m.p. 1280°; b.p. 2137°; d. 4.89	10g 50g
56-7500 HAZ	Barium nitrate (99.999%-Ba) PURATREM (10022-31-8) Ba(NO ₃) ₂ ; FW: 261.35; white xtl.; m.p. 592°; d. 3.230 <i>hygroscopic</i>	10g 50g
56-8600 HAZ	Bis(2,2,6,6-tetramethyl-3,5-heptanedionato)barium tetraglyme adduct (99.99%-Ba, Sr-0.5%) PURATREM (136629-60-2) Ba(C ₁₁ H ₁₉ O ₂) ₂ ·CH ₃ (OCH ₂ CH ₂) ₄ OCH ₃ ; FW: 503.85 (726.13); white xtl.; m.p. 103°	1g 5g
56-8610 HAZ	Bis(2,2,6,6-tetramethyl-3,5-heptanedionato)barium triglyme adduct (99.99%-Ba, Sr-0.5%) PURATREM (149160-45-2) Ba(C ₁₁ H ₁₉ O ₂) ₂ ·CH ₃ (OCH ₂ CH ₂) ₃ OCH ₃ ; FW: 503.85 (682.09); off-white powdr.; m.p. 88°	1g 5g

BISMUTH (Compounds)

93-8315	Bismuth(III) chloride, anhydrous (99.999%-Bi) PURATREM (7787-60-2) BiCl ₃ ; FW: 315.34; white xtl.; m.p. 230-232°; b.p. 447°; d. 4.75 <i>moisture sensitive</i>	5g 25g
83-2401 HAZ	Bismuth(III) 2-ethylhexanoate, 70-75% in xylenes (~24% Bi) (99.99+%-Bi) PURATREM (67874-71-9) Bi[OOCCH(C ₂ H ₅)C ₄ H ₉] ₃ ; FW: 638.61; light yellow liq.	25g 100g
83-3000	Bismuth(III) fluoride (99.99+%-Bi) PURATREM (7787-61-3) BiF ₃ ; FW: 265.98; white to gray xtl.; m.p. 727°; d. 5.32 <i>moisture sensitive</i>	10g 50g
93-8317 HAZ	Bismuth(III) iodide (99.999%-Bi) PURATREM (7787-64-6) BiI ₃ ; FW: 589.69; gray powdr.; m.p. 408°; b.p. ~500°; d. 5.778 <i>moisture sensitive</i>	5g 25g
93-8303 HAZ	Bismuth(III) nitrate pentahydrate (99.999%-Bi) PURATREM (10035-06-0) Bi(NO ₃) ₃ ·5H ₂ O; FW: 394.99 (485.07); white xtl.; d. 2.83 <i>moisture sensitive</i>	5g 25g 100g
93-8319	Bismuth(III) oxide (99.999%-Bi) PURATREM (1304-76-3) Bi ₂ O ₃ ; FW: 465.96; yellow powdr.; m.p. 817°; b.p. 1890°; d. 8.9	25g 100g 500g
83-4025	Bismuth(III) oxide (99.9998%-Bi) PURATREM (1304-76-3) Bi ₂ O ₃ ; FW: 465.96; yellow powdr.; m.p. 817°; b.p. 1890°; d. 8.9	25g 100g
93-8351	Bismuth(III) sulfide (99.999%-Bi) PURATREM (1345-07-9) Bi ₂ S ₃ ; FW: 514.15; gray to black powdr.; m.p. 685° dec.; d. 7.39	10g 50g
83-4075	Bismuth(III) telluride (99.99%-Bi) PURATREM (1304-82-1) Bi ₂ Te ₃ ; FW: 800.76; black powdr.; m.p. 573°	5g 25g

BORON (Compounds)

93-0559	Boric acid (99.99%-B) PURATREM (10043-35-3) H ₃ BO ₃ ; FW: 61.83; white xtl.; m.p. 171°; d. 1.435	250g 1kg
05-0205	Boric acid (99.9995%-B) PURATREM (10043-35-3) H ₃ BO ₃ ; FW: 61.83; white xtl.; m.p. 171°; d. 1.435	10g 50g
97-1725 amp HAZ 	Boron bromide, elec. gr. (99.999%-B) PURATREM (10294-33-4) BBr ₃ ; FW: 250.54; pale yellow to orange liq.; m.p. -46°; b.p. 91.3°; d. 2.6431 <i>moisture sensitive</i>	5g 25g 100g

BROMINE (Compounds)

06-0201	Carbon tetrabromide, vacuum sublimed (99.998%-C) PURATREM (558-13-4) See page 4	
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CADMIUM (Compounds)

48-0100 HAZ	Cadmium acetate, anhydrous (99.999%-Cd) PURATREM (543-90-8) Cd(OOCCH ₃) ₂ ; FW: 230.50; white powdr.; m.p. 232-235°	5g 25g
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CADIUM (Compounds)

48-0150 HAZ	Cadmium arsenide (99.999%-Cd) PURATREM (12006-15-4) Cd_3As_2 ; FW: 487.07; dark gray solid; d. 3.031 <i>moisture sensitive</i>	5g 25g
48-1500 HAZ	Cadmium chloride, anhydrous (99.995%-Cd) PURATREM (10108-64-2) CdCl_2 ; FW: 183.32; white powdr.; m.p. 568°; b.p. 960°; d. 4.047 <i>hygroscopic</i>	10g 50g
48-0200 HAZ	Cadmium chloride hydrate (99.998%-Cd) PURATREM (34330-64-8) $\text{CdCl}_2 \cdot \text{XH}_2\text{O}$; FW: 183.32; white xtl.	5g 25g
48-1501 amp HAZ	Cadmium chloride, (99.999%-Cd) ($\text{O}_2 < 50\text{ppm}$) PURATREM (10108-64-2) CdCl_2 ; FW: 183.32; -20 mesh white powdr. (under argon); m.p. 568°; b.p. 960°; d. 4.047 <i>hygroscopic</i>	5g 25g
93-4817 HAZ	Cadmium oxide (99.99%-Cd) PURATREM (1306-19-0) CdO ; FW: 128.40; reddish-brown powdr.; m.p. 1430°; d. 8.15	250g 1kg
48-0800 HAZ	Cadmium oxide (99.999%-Cd) PURATREM (1306-19-0) CdO ; FW: 128.40; red to brown powdr.; m.p. 1430°; d. 8.15	25g 100g 500g
93-4836 HAZ	Cadmium selenide (99.999+%-Cd) PURATREM (1306-24-7) CdSe ; FW: 191.36; black powdr.; m.p. > 1350°; d. 5.81	5g 25g
93-4840 HAZ	Cadmium sulfide (99.999%-Cd) PURATREM (1306-23-6) CdS ; FW: 144.46; yellow to orange powdr.; m.p. 1750°; d. 4.82	10g 50g 250g
48-2000 HAZ	Cadmium telluride (99.999%-Cd) PURATREM (1306-25-8) CdTe ; FW: 240.00; -200 mesh black powdr.; m.p. 1041°; d. 6.20	5g 25g
93-4825 HAZ	Cadmium telluride (99.999%-Cd) PURATREM (1306-25-8) CdTe ; FW: 240.00; black lumps; m.p. 1041°; d. 6.20	10g 50g
97-5040 HAZ 	Dimethylcadmium, elec. gr. (99.995+%-Cd) PURATREM (506-82-1) $(\text{CH}_3)_2\text{Cd}$; FW: 142.88; colorless liq.; m.p. -4.5°; b.p. 105.5°; f.p. -1°F; d. 1.985 (18°) <i>moisture sensitive, pyrophoric</i> Note: Material may contain a small amount of precipitate.	25g 100g

CALCIUM (Compounds)

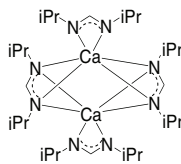
20-8200 NEW	Bis(N,N'-diisopropylformamidinato)calcium(II) dimer, (99.99 %-Ca) PURATREM (1959584-78-1) $\text{C}_{28}\text{H}_{60}\text{Ca}_2\text{N}_8$; FW: 588.99; tan to light-brown powdr. <i>air sensitive, moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2 .	1g 5g
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Technical Note:

- Calcium amidinate precursor for the atomic layer deposition (ALD) of calcium containing thin films.

References:

- Angew. Chem. Int. Ed.*, **2016**, 55, 10228–10233.



20-0200	Calcium carbonate (99.999%-Ca) PURATREM (471-34-1) CaCO_3 ; FW: 100.09; white powdr.; d. 2.930	10g 50g
20-2060	Calcium chloride hydrate (99.999+%-Ca) PURATREM (22691-02-7) $\text{CaCl}_2 \cdot \text{XH}_2\text{O}$; FW: 110.99; white powdr.	5g 25g 100g

CARBON (Compounds)

06-0201 amp HAZ	Carbon tetrabromide, vacuum sublimed (99.998%-C) PURATREM (558-13-4) CBr_4 ; FW: 331.65; white xtl.; m.p. 88-90°; b.p. 190°	25g 100g
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CERIUM (Compounds)

58-5801	Cerium(III) acetate hydrate (99.999%-Ce) (REO) PURATREM (206996-60-3) $\text{Ce}(\text{OOCCH}_3)_3 \cdot \text{XH}_2\text{O}$; FW: 317.26; white powdr.	25g 100g
58-0200	Cerium(III) chloride hydrate (99.99%-Ce) (REO) PURATREM (19423-76-8) $\text{CeCl}_3 \cdot \text{XH}_2\text{O}$; FW: 246.48; white to pale yellow xtl.	25g 100g
93-5814 HAZ	Cerium(III) nitrate hexahydrate (99.99%-Ce) (REO) PURATREM (10294-41-4) $\text{Ce}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$; FW: 326.17 (434.23); white xtl.	10g 50g

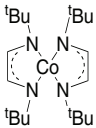
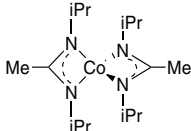
CERIUM (Compounds)

58-0800	Cerium(IV) oxide (99.995%-Ce) PURATREM (1306-38-3)	5g
	CeO ₂ ; FW: 172.12; yellow powdr.; m.p. ~2600°; d. 7.132	25g

CESIUM (Compounds)

93-5542	Cesium chloride (99.999%-Cs) PURATREM (7647-17-8)	10g
	CsCl; FW: 168.36; white xtl.; m.p. 646°; b.p. 1290°; d. 3.988 <i>hygroscopic</i>	50g
93-5544	Cesium iodide (99.999%-Cs) PURATREM (7789-17-5)	10g
	CsI; FW: 259.81; white xtl.; m.p. 621°; b.p. 1280°; d. 4.510 <i>hygroscopic</i>	50g
93-5545	Cesium nitrate (99.99%-Cs) PURATREM (7789-18-6)	10g
HAZ	CsNO ₃ ; FW: 194.91; white xtl.; m.p. 414°; d. 3.685 <i>hygroscopic</i>	50g

COBALT (Compounds)

27-1025	Bis(1,4-di-t-butyl-1,3-diazabutadienyl)cobalt(II) Co(DAD)₂, min. 98% (99.999%-Co) PURATREM (177099-51-3)	250mg
NEW	C ₂₀ H ₄₀ CoN ₄ ; FW: 395.49; dark green-blue xtl. <i>air sensitive</i> Note: U.S. Patent Application No. 13/818,154. Product sold under, use subject to, terms and conditions of label license at www.strem.com/waynestate1	1g 5g
		
27-0486	Bis(N,N'-di-i-propylacetamidinato)cobalt(II), min. 98% (99.99%-Co) PURATREM (Co(iPr-MeAMD)₂ (635680-58-9)	250mg
NEW	C ₁₈ H ₃₄ CoN ₄ ; FW: 341.40; green xtl. <i>air sensitive, moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2 .	1g 5g
		
27-0405	Cobalt(II) chloride, anhydrous (99.999%-Co) PURATREM (7646-79-9)	1g
NEW	CoCl ₂ ; FW: 129.84; blue powdr.	5g
HAZ	<i>hygroscopic</i>	25g
93-2735	Cobalt(II) chloride hexahydrate (99.999%-Co) PURATREM (7791-13-1)	5g
	CoCl ₂ ·6H ₂ O; FW: 129.84 (237.93); red xtl.; m.p. 86°; d. 1.924	25g
93-2746	Cobalt(II) nitrate hexahydrate (99.999%-Co) PURATREM (10026-22-9)	5g
HAZ	Co(NO ₃) ₂ ·6H ₂ O; FW: 182.99 (291.05); red to purple xtl.; m.p. 55-56°; d. 1.87	25g
27-0490	Cobalt(II,III) oxide (99.9985%-Co) PURATREM (1308-06-1)	5g
	Co ₃ O ₄ ; FW: 240.80; gray to black powdr.	25g
93-2750	Cobalt(II) sulfate heptahydrate (99.999%-Co) PURATREM (10026-24-1)	10g
	CoSO ₄ ·7H ₂ O; FW: 155.00 (281.10); pink to red xtl.; m.p. 96.8°; d. 1.948	50g
93-2708	Hexaamminecobalt(III) chloride (99.999%-Co) PURATREM (10534-89-1)	10g
	[Co(NH ₃) ₆]Cl ₃ ; FW: 267.46; orange powdr.; m.p. 217°; d. 1.710	50g

COPPER (Compounds)

29-0360	Copper(I) chloride (99.99%-Cu) PURATREM (7758-89-6)	10g
HAZ	CuCl; FW: 98.99; light-gray to pale green solid; m.p. 430°; b.p. 1490°; d. 4.14 <i>air sensitive, light sensitive</i>	50g
93-2985	Copper(II) chloride dihydrate (99.999%-Cu) PURATREM (10125-13-0)	10g
HAZ	CuCl ₂ ·2H ₂ O; FW: 134.44 (170.48); green xtl.; d. 2.54	50g
29-2928	Copper(II) hexafluoroacetylacetonate, anhydrous, elec. gr. (99.99+%-Cu) PURATREM (14781-45-4)	1g
	Cu(CF ₃ COCHCOCF ₃) ₂ ; FW: 477.64; blue xtl. <i>moisture sensitive</i>	5g
29-2929	Copper(II) hexafluoroacetylacetonate hydrate, elec. gr. (99.99+%-Cu) PURATREM (14781-45-4)	1g
	Cu(CF ₃ COCHCOCF ₃) ₂ ·XH ₂ O; FW: 477.64; green to blue xtl.; m.p. 85-89°; b.p. dec. 220° (subl. 70°/0.05mm) <i>hygroscopic</i>	5g 25g

COPPER (Compounds)

29-0485	Copper(I) iodide (99.999%-Cu) PURATREM (7681-65-4) CuI; FW: 190.45; off-white to pale brown powdr.; m.p. 605°; b.p. 1290°; d. 5.62	10g 50g
93-2940 HAZ	Copper(II) nitrate trihydrate (99.999%-Cu) PURATREM (10031-43-3) Cu(NO ₃) ₂ ·3H ₂ O; FW: 187.56 (241.60); blue xtl.; m.p. 114.5°; d. 2.32	5g 25g 100g
29-0590	Copper(II) oxide (99.995%-Cu) PURATREM (1317-38-0) CuO; FW: 79.55; 80-100 mesh black powdr.; m.p. 1362°; d. 6.3-6.49	10g 50g
93-2959	Copper(II) sulfate pentahydrate (99.999%-Cu) PURATREM (7758-99-8) CuSO ₄ ·5H ₂ O; FW: 159.60 (249.68); blue xtl.; m.p. 110° dec.; d. 2.284	5g 25g 100g

DYSPROSIUM (Compounds)

93-6616	Dysprosium(III) oxide (99.998%-Dy) (REO) PURATREM (1308-87-8) Dy ₂ O ₃ ; FW: 372.99; white powdr.; m.p. 2330-2350°; d. 7.81	5g 25g
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ERBIUM (Compounds)

68-6804	Erbium(III) chloride hydrate (99.999%-Er) (REO) PURATREM (10025-75-9) ErCl ₃ ·XH ₂ O; FW: 273.64; pink xtl. <i>hygroscopic</i>	10g 50g
68-6805	Erbium(III) chloride hydrate (99.999+%-Er) (low Ca, Fe, Mg) PURATREM (10025-75-9) ErCl ₃ ·XH ₂ O; FW: 273.64; pink xtl. <i>hygroscopic</i>	10g 50g
93-6820	Erbium(III) oxide (99.995%-Er) (REO) PURATREM (12061-16-4) Er ₂ O ₃ ; FW: 382.51; rose powdr.; m.p. 2400°; d. 8.640	5g 25g

EUROPIUM (Compounds)

93-6322	Europium(III) fluoride, anhydrous (99.99%-Eu) (REO) PURATREM (13765-25-8) EuF ₃ ; FW: 208.96; white powdr.; m.p. 1390°; b.p. 2280° <i>hygroscopic</i>	1g 5g
93-6312	Europium(III) oxide (99.99%-Eu) (REO) PURATREM (1308-96-9) Eu ₂ O ₃ ; FW: 351.92; white powdr.; d. 7.42	5g 25g 100g
93-6330	Europium(III) sulfate octahydrate (99.99%-Eu) (REO) PURATREM (10031-55-7) Eu ₂ (SO ₄) ₃ ·8H ₂ O; FW: 592.11 (736.23); white xtl.	1g 5g

GADOLINIUM (Compounds)

64-3000	Gadolinium(III) carbonate hydrate (99.99%-Gd) (REO) PURATREM (38245-36-2) Gd ₂ (CO ₃) ₃ ·XH ₂ O; FW: 494.53; white powdr.	10g 50g
93-6406	Gadolinium(III) oxide (99.99%-Gd) (REO) PURATREM (12064-62-9) Gd ₂ O ₃ ; FW: 362.50; white powdr.; m.p. 2310°; d. 7.407	100g 500g

GALLIUM (Compounds)

93-3130	Gallium(III) acetylacetonate (99.99+%-Ga) PURATREM (14405-43-7) Ga(CH ₃ COCHCOCH ₃) ₃ ; FW: 367.05; white to pale yellow powdr.; m.p. 192-194° dec. >280°; b.p. 140°/10 mm subl.; d. 1.42	5g 25g
93-3103 HAZ	Gallium arsenide (99.9999%-Ga) PURATREM (1303-00-0) GaAs; FW: 144.64; 25mm and down polycrystalline pieces; m.p. 1238°; d. 5.31	1g 5g
93-3109 HAZ	Gallium(III) bromide, anhydrous, granular (99.999%-Ga) PURATREM (13450-88-9) GaBr ₃ ; FW: 309.45; white granules; m.p. 121.5°; b.p. 278.8°; d. 3.69 <i>moisture sensitive</i>	1g 5g

GALLIUM (Compounds)

93-3104 amp HAZ	Gallium(II) chloride, anhydrous (99.999%-Ga) PURATREM (13498-12-9) Ga ₂ Cl ₃ ; FW: 281.26; white xtl.; m.p. 164°; b.p. 535° <i>moisture sensitive</i>	1g 5g
93-3141 amp HAZ	Gallium(III) chloride, anhydrous, fused lump (99.999%-Ga) PURATREM (13450-90-3) GaCl ₃ ; FW: 176.03; white fused lump; m.p. 77.9°; b.p. 201.3°; d. 2.47 <i>moisture sensitive</i>	5g 25g 100g
93-3140 HAZ	Gallium(III) chloride, anhydrous, granular (99.999%-Ga) PURATREM (13450-90-3) GaCl ₃ ; FW: 176.03; white crystalline powdr.; m.p. 77.9°; b.p. 201.3°; d. 2.47 <i>moisture sensitive</i> Note: Packaged in PFA/FET bottle.	5g 25g 100g
31-1370 	Gallium (III) fluoride trihydrate (99.99%-Ga) PURATREM (7783-51-9) GaF ₃ ·3H ₂ O; FW: 126.72 (180.76); white xtl. <i>hygroscopic</i>	1g 5g
93-3105 HAZ	Gallium(III) nitrate hydrate (99.99%-Ga) PURATREM (69365-72-6) Ga(NO ₃) ₃ ·XH ₂ O; FW: 255.73; white xtl.; m.p. 110° dec. <i>hygroscopic</i>	5g 25g
93-3106	Gallium(III) oxide (99.998%-Ga) PURATREM (12024-21-4) Ga ₂ O ₃ ; FW: 187.44; white powdr.; m.p. 1900°; d. 5.88	5g 25g 100g
93-3123	Gallium phosphide (99.999%-Ga) PURATREM (12063-98-8) GaP; FW: 100.69; amber xtl.; m.p. 1348°; d. 4.1	2g 10g
93-3126	Gallium(III) sulfate hydrate (99.999%-Ga) PURATREM (13780-42-2) Ga ₂ (SO ₄) ₃ ·XH ₂ O; FW: 427.62; white xtl.; d. 3.86 <i>hygroscopic</i>	5g
98-1862 HAZ 	Triethylgallium, elec. gr. (99.9999%-Ga) PURATREM (1115-99-7) (C ₂ H ₅) ₃ Ga; FW: 156.91; colorless liq.; m.p. -82.3°; b.p. 143°; f.p. 69.8°F; d. 1.0586 <i>moisture sensitive, pyrophoric</i>	50g 100g
98-2000 HAZ 	Trimethylgallium, elec. gr. (99.9999%-Ga) PURATREM (1445-79-0) (CH ₃) ₃ Ga; FW: 114.83; colorless liq.; m.p. -15.8°; b.p. 55.7°; f.p. -1°F; d. 1.151 <i>moisture sensitive, pyrophoric</i> Note: Available prepacked in ALD cylinder- see 98-4047.	50g 100g
98-4047 HAZ 	Trimethylgallium, elec. gr. (99.9999%-Ga) PURATREM, 98-2000, contained in 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (1445-79-0) (CH ₃) ₃ Ga; FW: 114.83; colorless liq.; m.p. -15.8°; b.p. 55.7°; f.p. -1°F; d. 1.151 <i>moisture sensitive, pyrophoric</i>	10g 25g
31-5000	Tris(2,2,6,6-tetramethyl-3,5-heptanedionato)gallium(III), 99% (99.999%-Ga) [Ga(TMHD)₃] PURATREM (34228-15-4) Ga(C ₁₁ H ₁₉ O ₇) ₃ ; FW: 619.54; white xtl.; m.p. 219-220°; b.p. dec. 360° (subl. 170°/0.2mm)	1g 5g 25g

GERMANIUM (Compounds)

93-3225 amp HAZ	Germanium(IV) bromide (99.99%-Ge) PURATREM (13450-92-5) GeBr ₄ ; FW: 392.23; white xtl.; m.p. 26.1°; b.p. 186.5°; d. 3.132 <i>moisture sensitive</i>	10g
32-0650 amp HAZ	Germanium(IV) chloride (99.99%-Ge) PURATREM (10038-98-9) GeCl ₄ ; FW: 214.40; colorless liq.; m.p. -49.5°; b.p. 83.1°; d. 1.880 <i>moisture sensitive</i>	10g 50g
32-0700 amp HAZ	Germanium(IV) chloride (99.9999%-Ge) PURATREM (10038-98-9) GeCl ₄ ; FW: 214.40; colorless liq.; m.p. -49.5°; b.p. 83.1°; d. 1.880 <i>moisture sensitive</i>	25g 100g 5 x 100g

GERMANIUM (Compounds)

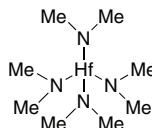
93-3206 HAZ	Germanium(IV) ethoxide (99.99%-Ge) PURATREM (14165-55-0) Ge(OC ₂ H ₅) ₄ ; FW: 252.85; colorless liq.; m.p. -81°; b.p. 185.5°; d. 1.14 <i>moisture sensitive</i>	1g 5g 25g
93-3205	Germanium(II) iodide (99.99%-Ge) PURATREM (13573-08-5) GeI ₂ ; FW: 326.40; -10 mesh yellow powdr.; m.p. dec.; d. 5.73 <i>moisture sensitive</i>	1g 5g
93-3226 amp HAZ	Germanium(IV) iodide (99.999%-Ge) PURATREM (13450-95-8) GeI ₄ ; FW: 580.21; orange to red xtl.; m.p. 146°; b.p. 350°; d. 4.416 <i>moisture sensitive</i>	5g 25g
93-3221	Germanium(IV) oxide (99.999%-Ge) PURATREM (1310-53-8) GeO ₂ ; FW: 104.59; white powdr., hexagonal (soluble) form; m.p. 1111-1119°; d. 4.228	5g 25g
97-3222	Germanium(IV) oxide, elec. gr. (99.9999%-Ge) PURATREM (1310-53-8) GeO ₂ ; FW: 104.59; white powdr.; m.p. 1111-1119°; d. 4.228	10g 50g
93-3224	Germanium(IV) selenide (99.999%-Ge) PURATREM (12065-11-1) GeSe ₂ ; FW: 230.51; orange xtl.; m.p. 707°; d. 4.56	1g 5g
93-3209	Germanium(II) sulfide (99.99+%-Ge) (contains 1-5% germanium metal) PURATREM (12025-32-0) GeS; FW: 104.65; black xtl.; m.p. 530°	2g 10g

GOLD (Compounds)

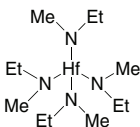
02-1000	Ammonium tetrachloroaurate(III) hydrate (99.9985%-Au) PURATREM (13874-04-9) See page 1	
79-1900	Gold(I) chloride, 97% (99.99%-Au) PURATREM (10294-29-8) AuCl; FW: 232.42; yellow powdr.; m.p. 289° dec.; d. 7.4	250mg 1g 5g
79-2200 HAZ	Hydrogen tetrachloroaurate(III) hydrate (99.9985%-Au) (49% Au) PURATREM (27988-77-8) HAuCl ₄ ·xH ₂ O; FW: 339.79; yellow to orange xtl. <i>light sensitive, hygroscopic, (store cold)</i>	1g 5g
93-7906	Potassium tetrachloroaurate(III) hydrate (99.99%-Au) (51%-Au) PURATREM (13682-61-6) See page 15	

HAFNIUM (Compounds)

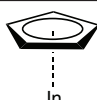
72-5200	Hafnium(IV) oxide (99.995%-Hf, <0.15% Zr) PURATREM (12055-23-1) HfO ₂ ; FW: 210.49; off-white powdr.; m.p. 2812°; d. 9.68	1g 5g
72-7750 amp HAZ	Tetrakis(diethylamino)hafnium, 99% (99.99%-Hf, <0.2% Zr) PURATREM (19824-55-6) Hf[N(CH ₂ CH ₃) ₂] ₄ ; FW: 467.01; light yellow liq. <i>moisture sensitive</i>	1g 5g 25g
72-8000 HAZ	Tetrakis(dimethylamino)hafnium, 98+% (99.99+%-Hf, <0.2% Zr) TDMAH, PURATREM (19782-68-4) Hf(N(CH ₃) ₂) ₄ ; FW: 354.79; colorless to pale yellow xtl.; m.p. 38-41°; b.p. 85°/0.1mm; d. 1.098 <i>moisture sensitive, (store cold)</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 . Available prepacked in ALD cylinder- see 98-4021, 98-4022.	1g 5g 25g
98-4021 HAZ	Tetrakis(dimethylamino)hafnium, 98+% (99.99+%-Hf, <0.2%-Zr) TDMAH, PURATREM, 72-8000, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (19782-68-4) Hf(N(CH ₃) ₂) ₄ ; FW: 354.79; colorless to pale yellow xtl.; m.p. 38-41°; b.p. 85°/0.1mm <i>moisture sensitive, (store cold)</i> Note: High temperature Swagelok® cylinder assembly 96-1071 available at extra cost. See 98-4022. Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 .	25g
98-4022 HAZ	Tetrakis(dimethylamino)hafnium, 98+% (99.99+%-Hf, <0.2%-Zr) TDMAH, PURATREM, 72-8000, contained in 50ml Swagelok® cylinder (96-1071) for CVD/ALD (19782-68-4) Hf(N(CH ₃) ₂) ₄ ; FW: 354.79; colorless to pale yellow xtl. <i>moisture sensitive, (store cold)</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 .	25g



HAFNIUM (Compounds)

72-7720 amp HAZ	Tetrakis(ethylmethylamino)hafnium, 99% (99.99%+Hf, <0.15% Zr) TEMA PURATREM (352535-01-4) $\text{Hf}[\text{N}(\text{CH}_3)(\text{CH}_2\text{CH}_3)]_4$; FW: 410.90; colorless to yellow liq.; b.p. 79°/0.1mm; d. 1.324 <i>moisture sensitive</i> Note: Available prepacked in ALD cylinder- see 98-4048. Volatile precursor for the ALD, CVD and MOCVD deposition of hafnium oxide.		2g 10g
98-4048 HAZ	Tetrakis(ethylmethylamino)hafnium, 99% (99.99%+Hf, <0.15% Zr) TEMA, PURATREM, 72-7720, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (352535-01-4) $\text{Hf}[\text{N}(\text{CH}_3)(\text{CH}_2\text{CH}_3)]_4$; FW: 410.90; colorless to yellow liq.; f.p. 52°F <i>moisture sensitive</i> Note: High temperature Swagelok® cylinder assembly 96-1071 available at extra cost.		10g

INDIUM (Compounds)

98-4057 HAZ	Cyclopentadienylindium (I), elec. gr. (99.99%+In) PURATREM, 97-3425, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (34822-89-4) $\text{C}_5\text{H}_5\text{In}$; FW: 179.92; off-white to light yellow xtl.; b.p. subl. 50°/0.01mm <i>air sensitive, heat sensitive, light sensitive</i>		5g
97-3425 HAZ	Cyclopentadienylindium(I), elec. gr. (99.99%+In) PURATREM (34822-89-4) $\text{C}_5\text{H}_5\text{In}$; FW: 179.92; off-white to light yellow xtl.; b.p. subl. 50°/0.01 mm <i>air sensitive, heat sensitive, light sensitive</i> Note: Available prepacked in ALD cylinder- see 98-4057, 98-4054.		250mg 1g 5g

Technical Note:

1. ALD precursor for Indium oxide using cyclopentadienyl indium and mixture of water and oxygen.

References:

1. ECS Transactions, 2011, 41, 2, 147

98-4054 HAZ	Cyclopentadienylindium(I), elec. gr. (99.99%+In) PURATREM, 97-3425, contained in 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (34822-89-4) $\text{C}_5\text{H}_5\text{In}$; FW: 179.92; off-white to light yellow xtl.; b.p. subl. 50°/0.01 mm <i>air sensitive, heat sensitive, light sensitive</i>		5g
93-4923 HAZ	Indium (III) nitrate pentahydrate (99.999%-In) PURATREM (13465-14-0) $\text{In}(\text{NO}_3)_3 \cdot \text{XH}_2\text{O}$; FW: 300.83 (390.83); white xtl. <i>hygroscopic</i>		10g 50g
93-4936	Indium(III) acetate (99.99%-In) PURATREM (25114-58-3) $\text{In}(\text{OOCCH}_3)_3$; FW: 291.95; white xtl. <i>moisture sensitive</i>		5g 25g
93-4920	Indium(III) antimonide (99.99%-In) PURATREM (1312-41-0) InSb; FW: 236.57; black xtl.; m.p. 535°; d. 5.76		5g 25g
93-4929	Indium(III) bromide, anhydrous (99.999%-In) PURATREM (13465-09-3) InBr_3; FW: 354.55; white to light yellow powdr.; m.p. ~436°; d. 4.74 <i>hygroscopic</i>		5g 25g
93-4930	Indium(III) chloride, anhydrous (99.99%-In) PURATREM (13465-10-6) InCl_3; FW: 150.27; golden yellow powdr.; m.p. ~225°; b.p. 608°; d. 4.19 <i>air sensitive, moisture sensitive</i>		2g 10g
93-4932	Indium(III) chloride, anhydrous (99.999%-In) PURATREM (10025-82-8) InCl_3; FW: 221.18; white powdr.; m.p. 586°; d. 3.46 <i>hygroscopic</i>		5g 25g 100g
93-4931	Indium(III) chloride tetrahydrate (99.99%-In) PURATREM (22519-64-8) $\text{InCl}_3 \cdot 4\text{H}_2\text{O}$; FW: 221.18 (293.26); white xtl.		5g 25g 100g
93-4915	Indium(III) iodide (99.999%-In) PURATREM (13510-35-5) InI_3; FW: 495.53; yellow to red solid; m.p. 210°; d. 4.69 <i>hygroscopic</i>		1g 5g 25g

INDIUM (Compounds)

93-4906	Indium(III) oxide (99.998%-In) PURATREM (1312-43-2) In ₂ O ₃ ; FW: 277.64; yellow pwdr.; d. 7.179	5g 25g
93-4926	Indium(III) phosphide (99.999%-In) PURATREM (22398-80-7) InP; FW: 145.79; black xtl.; 1/4" pieces and down; m.p. 1070°	1g 5g
93-4927	Indium(III) sulfate hydrate (99.999%-In) PURATREM (13464-82-9) In ₂ (SO ₄) ₃ ·XH ₂ O; FW: 517.83; white xtl.	10g 50g
93-4911	Indium(III) sulfide (99.99%-In) PURATREM (12030-24-9) In ₂ S ₃ ; FW: 325.83; orange pwdr.; m.p. 1050°; d. 4.45	5g 25g
98-2010 HAZ 	Trimethylindium, elec. gr. (99.999%-In) PURATREM (3385-78-2) (CH ₃) ₃ In; FW: 159.93; white xtl.; m.p. 88°; f.p. -1°F; d. 1.568 <i>heat sensitive, moisture sensitive, pyrophoric, (store cold)</i> Note: Available prepacked in ALD cylinder- see 98-4056.	25g 100g

WARNING - Trimethylindium may undergo rapid thermal decomposition if exposed to temperatures above 100°C.
Never attempt to distill the material at atmospheric pressure

98-4056 HAZ 	Trimethylindium, elec. gr. (99.999%-In) PURATREM, 98-2010, contained in 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (3385-78-2) (CH ₃) ₃ In; FW: 159.93; white xtl.; m.p. 88°; f.p. -1°F; d. 1.568 <i>heat sensitive, moisture sensitive, pyrophoric, (store cold)</i>	25g
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WARNING - Trimethylindium may undergo rapid thermal decomposition if exposed to temperatures above 100°C.
Never attempt to distill the material at atmospheric pressure

IRIDIUM (Compounds)

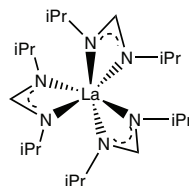
77-3010 NEW	Iridium(III) chloride, hydrate (99.99+%-Ir) PURATREM [free of Ir(IV) by electrochemical analysis] (14996-61-3) IrCl ₃ ·XH ₂ O; FW: 298.58; black xtl. <i>hygroscopic</i>	250mg 1g 5g
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IRON (Compounds)

26-2520 HAZ	Iron 2-ethylhexanoate, 6% (Fe) in mineral spirits (99.998+%-Fe) PURATREM (7321-53-1) Fe[OOCCH(C ₂ H ₅)C ₄ H ₉] ₃ ; FW: 485.46; liq.	50g 250g
93-2672 HAZ	Iron(III) nitrate nonahydrate (99.999%-Fe) PURATREM (7782-61-8) Fe(NO ₃) ₃ ·9H ₂ O; FW: 241.86 (404.02); colorless to pale violet xtl.; m.p. 47.2°; b.p. 125° dec.; d. 1.684 <i>hygroscopic</i>	5g 25g
26-2750	Iron(III) oxide (99.995%-Fe) PURATREM (1309-37-1) Fe ₂ O ₃ ; FW: 159.69; red to brown pwdr.; m.p. 1565°	10g 50g

LANTHANUM (Compounds)

57-5731	Lanthanum(III) chloride hydrate (99.999%-La) (REO) PURATREM (10025-84-0) LaCl ₃ ·XH ₂ O; FW: 245.27; white xtl.; m.p. 91° dec. <i>hygroscopic</i>	25g 100g
57-5730	Lanthanum(III) chloride hydrate (99.999+%-La) (low Ca, Fe, Mg) PURATREM (10025-84-0) LaCl ₃ ·XH ₂ O; FW: 245.27; white xtl.; m.p. 91° dec. <i>hygroscopic</i>	25g 100g
57-2000	Lanthanum(III) fluoride, anhydrous (99.99%-La) (REO) PURATREM (13709-38-1) LaF ₃ ; FW: 195.90; white lumps; m.p. 1493°; d. 5.936 <i>hygroscopic</i>	25g 100g
93-5732 HAZ	Lanthanum(III) nitrate hexahydrate (99.99%-La) (REO) PURATREM (10277-43-7) La(NO ₃) ₃ ·6H ₂ O; FW: 324.93 (433.02); white xtl.; m.p. 40°; b.p. 126° dec. <i>hygroscopic</i>	25g 100g 500g
57-5732 HAZ	Lanthanum(III) nitrate hexahydrate (99.999%-La) (REO) PURATREM (10277-43-7) La(NO ₃) ₃ ·6H ₂ O; FW: 324.93 (433.02); white xtl.; m.p. 40°; b.p. 126° dec.	25g 100g
93-5716	Lanthanum(III) oxide (99.99%-La) (REO) PURATREM (1312-81-8) La ₂ O ₃ ; FW: 325.82; white powdr.; m.p. 2315°; b.p. 4200°; d. 6.51	100g 500g
93-5741	Lanthanum(III) oxide (99.999%-La) (REO) PURATREM (1312-81-8) La ₂ O ₃ ; FW: 325.82; white powdr.; m.p. 2315°; b.p. 4200°; d. 6.51	25g 100g
57-1200 NEW amp HAZ	Tris(N,N'-di-i-propylformamidinato)lanthanum(III), (99.999+%-La) PURATREM La-FMD (1034537-36-4) C ₂₁ H ₄₅ LaN ₆ ; FW: 520.53; white to off-white powdr. <i>air sensitive, moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2 .	1g 5g



Technical Note:

1. Lanthanum precursor for the ALD/CVD of La₂O₃, LaLuO₃, LaScO₃, and LaYO₃ thin films.

References:

1. *Appl. Phys. Lett.*, **2009**, 94, 262904
2. *Electrochem. Solid-State Lett.*, **2009**, 12, G13
3. *Appl. Phys. Lett.*, **2010**, 97, 162910
4. *J. Electrochem. Soc.*, **2011**, 158, H447
5. *ECS Trans.*, **2012**, 45, 95
6. *Nano Lett.*, **2013**, 13, 594
7. *J. Crystal Growth*, **2013**, 363, 150
8. *ECS Trans.*, **2013**, 54, 255
9. *App. Surface Sci.*, **2014**, 292, 880
10. *Proc. SPIE*, **2014**, 8987, 898712

LEAD (Compounds)

82-0595 HAZ	Lead(II) acetate trihydrate (99.999%-Pb) PURATREM (6080-56-4) Pb(OOCCH ₃) ₂ ·3H ₂ O; FW: 325.28 (379.33); white xtl.; m.p. 75° dec.; d. 2.55	25g 100g
82-0750 HAZ	Lead(II) iodide (99.999+%-Pb) PURATREM (10101-63-0) PbI ₂ ; FW: 461.00; yellow powdr.; m.p. 402°; b.p. 954°; d. 6.16	10g 50g
93-8267 HAZ	Lead(II) nitrate (99.999%-Pb) PURATREM (10099-74-8) Pb(NO ₃) ₂ ; FW: 331.20; white xtl.; m.p. 470° dec.; d. 4.53 <i>hygroscopic</i>	25g 100g
93-8219	Lead(II) oxide (99.999+%-Pb) PURATREM (1317-36-8) PbO; FW: 223.19; yellow powdr.; m.p. 888°; d. 9.53	10g 50g
93-8257 HAZ	Lead(II) selenide (99.99%-Pb) PURATREM (12069-00-0) PbSe; FW: 286.15; gray to black pieces; m.p. 1065°; d. 8.10	5g 25g
93-8233	Lead(II) sulfide (99.999%-Pb) PURATREM (1314-87-0) PbS; FW: 239.25; black powdr.; m.p. 1114°; d. 7.5	5g 25g

LITHIUM (Compounds)

93-0312	Lithium carbonate (99.99%-Li) PURATREM (554-13-2)	25g
	Li ₂ CO ₃ ; FW: 73.89; white pwdr.; m.p. 723°; b.p. 1310° dec.; d. 2.11	100g
03-0800	Lithium carbonate (99.999%-Li) PURATREM (554-13-2)	25g
	Li ₂ CO ₃ ; FW: 73.89; white pwdr.; m.p. 723°; b.p. 1310° dec.; d. 2.11	100g
03-0900	Lithium chloride hydrate (99.996%-Li) PURATREM (16712-20-2)	10g
	LiCl·XH ₂ O; FW: 42.39; white xtl.	50g
93-0338	Lithium niobate (99.998%-Nb) PURATREM (12031-63-9)	25g
	LiNbO ₃ ; FW: 147.85; white pwdr.	100g
93-0384	Lithium tantalate (99.998%-Ta) PURATREM (12031-66-2)	2g
	LiTaO ₃ ; FW: 235.89; white pwdr.	10g
93-0365	Lithium tetraborate (99.998%-Li) PURATREM (12007-60-2)	10g
	Li ₂ B ₄ O ₇ ; FW: 169.12; white pwdr.; m.p. 917°	50g

LUTETIUM (Compounds)

93-7115	Lutetium(III) oxide (99.999%-Lu) (REO) PURATREM (12032-20-1)	1g
	Lu ₂ O ₃ ; FW: 397.94; white pwdr.; m.p. 2487°; d. 9.41	5g

MAGNESIUM (Compounds)

97-1040	Bis(cyclopentadienyl)magnesium (99.99+%-Mg) PURATREM		1g
amp	(1284-72-6)	Mg	5g
HAZ	(C ₅ H ₅) ₂ Mg; FW: 154.49; white to light pink xtl.; m.p. 176°; b.p. 290° (subl. 160°/0.1mm) <i>air sensitive, moisture sensitive</i>		25g
97-1045	Bis(pentamethylcyclopentadienyl)magnesium, elec. gr. (99.999%-Mg) PURATREM		1g
amp	(74507-64-5)		5g
HAZ	[(CH ₃) ₅ C ₅] ₂ Mg; FW: 294.77; white to yellow xtl. <i>air sensitive, moisture sensitive</i>		25g
12-1100	Magnesium aluminum i-propoxide (99.99%-Mg) PURATREM (69207-83-6)		10g
HAZ	MgAl ₂ (OC ₃ H ₇) ₆ ; FW: 550.97; white xtl.; m.p. 40°; b.p. 110°/5 mm <i>moisture sensitive</i>		50g
93-1226	Magnesium fluoride (99.99+%-Mg) PURATREM (7783-40-6)		25g
	MgF ₂ ; FW: 62.32; 1-4mm white pieces; m.p. 1248°; b.p. 2239°; d. 3.0		100g
93-1237	Magnesium nitrate hexahydrate (99.999%-Mg) PURATREM (13446-18-9)		25g
HAZ	Mg(NO ₃) ₂ ·6H ₂ O; FW: 148.32 (256.41); white xtl.; m.p. 89°; d. 1.64 <i>hygroscopic</i>		100g
12-2025	Magnesium oxide (99.99+%-Mg) PURATREM (1309-48-4)		5g
	MgO; FW: 40.31; white pwdr.; m.p. 2800°; b.p. 3600°; d. 3.58		25g
12-1212	Magnesium (N,N,N',N'-tetramethylethylenediamine)bis[BREW] (99.99+%-Mg) PURATREM		1g
	Mg(C ₆ H ₁₆ N ₂)[C _x H _y C(O)CHC(O)C _x H _y] ₂ (x=3-4, y=2x+1); pale yellow liq. <i>moisture sensitive</i> Note: ***Limited quantities available. Will discontinue when stock gone***		5g

Technical Note:

- See 56-5656 (page 2)

MANGANESE (Compounds)

25-0760	Manganese(II) acetate tetrahydrate (99.999%-Mn) PURATREM (6156-78-1)	5g
	Mn(CH ₃ COO) ₂ ·4H ₂ O; FW: 173.02 (245.08); pale pink xtl.; d. 1.589	25g
25-1345	Manganese(II) chloride anhydrous (99.995%-Mn) PURATREM (7773-01-5)	5g
NEW	MnCl ₂ ; FW: 125.84; pink solid; m.p. 650°; b.p. 1190°; d. 2.98	25g
	<i>hygroscopic</i>	100g
25-1355	Manganese(II) chloride tetrahydrate (99.995%-Mn) PURATREM (13446-34-9)	5g
	MnCl ₂ ·4H ₂ O; FW: 125.84 (197.91); rose xtl.; m.p. 58°; d. 2.01	25g
25-1380	Manganese(IV) oxide (99.995%-Mn) PURATREM (1313-13-9)	10g
HAZ	MnO ₂ ; FW: 86.94; black, random pieces; m.p. 535° dec.; d. 5.026	50g

MERCURY (Compounds)

80-8008	Mercury(II) iodide, anhydrous (99.999%-Hg) PURATREM (7774-29-0)	5g
amp	HgI ₂ ; FW: 454.45; orange to red powdr.; m.p. 259°; b.p. 354°; d. 6.271	25g
HAZ		
93-8013	Mercury(II) selenide (99.99%-Hg) PURATREM (20601-83-6)	1g
HAZ	HgSe; FW: 279.55; gray powdr.	25g

MOLYBDENUM (Compounds)

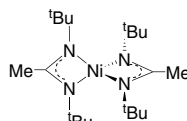
02-0750	Ammonium molybdate tetrahydrate (99.999%-Mo) PURATREM (12027-67-7)	
	See page 1	
42-1000	Ammonium tetrathiomolybdate(VI), 99% (99.99%-Mo) PURATREM (15060-55-6)	
	See page 2	
42-1475	Molybdenum(VI) oxide (99.998%-Mo) PURATREM (1313-27-5)	10g
	MoO ₃ ; FW: 143.95; pale green powdr.; m.p. 795°; b.p. subl.; d. 4.69	50g
42-1476	Molybdenum(VI) oxide (99.999%-Mo) PURATREM (1313-27-5)	10g
	MoO ₃ ; FW: 143.95; pale green powdr.; m.p. 795°; b.p. subl.; d. 4.69	50g

NEODYMIUM (Compounds)

60-6030	Neodymium(III) chloride hydrate (99.997%-Nd) (REO) PURATREM (13477-89-9)	10g
	NdCl ₃ ·XH ₂ O; FW: 250.60; purple xtl.	50g
	<i>hygroscopic</i>	
93-6024	Neodymium(III) nitrate hexahydrate (99.999%-Nd) (REO) PURATREM (16454-60-7)	5g
HAZ	Nd(NO ₃) ₃ ·6H ₂ O; FW: 330.26 (438.35); purple xtl.	25g
	<i>hygroscopic</i>	
93-6009	Neodymium(III) oxide (99.99+%-Nd) (REO) PURATREM (1313-97-9)	5g
	Nd ₂ O ₃ ; FW: 336.48; blue powdr.; m.p. 2272°; d. 7.24	25g

NICKEL (Compounds)

28-0045	Bis(N,N'-di-t-butylacetamidinato)nickel(II), (99.999%-Ni) PURATREM (940895-79-4)	250mg
amp	C ₂₀ H ₄₂ N ₄ Ni; FW: 397.27; dark, purple-black xtl.; m.p. 95-96°	1g
	<i>air sensitive, moisture sensitive</i>	5g
	Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2 .	



Technical Notes:

1. CVD/ALD precursor for the preparation of nickel nitride (NiNx) films.
2. CVD/ALD precursor for the preparation of nickel sulfide (NiSx) films co-deposited by H₂S.

References:

1. *Chem. Mater.*, **2010**, 22, 3060
2. *Chem. Mater.*, **2016**, 28, 1155.

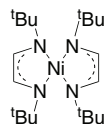
NICKEL (Compounds)

28-0225

NEW

Bis(1,4-di-*t*-butyl-1,3-diazabutadienyl)nickel(II) Ni(DAD)2,
min. 98% (99.999%-Ni) PURATREM
 $C_{20}H_{40}N_4Ni$; FW: 395.25; dichroic red/green xtl
air sensitive

Note: U.S. Patent Application No. 13/818,154. Product sold
under, use subject to, terms and conditions of label license at
www.strem.com/waynestate1



250mg

1g

5g

28-1100

Nickel(II) acetate tetrahydrate (99.999%-Ni) PURATREM (6018-89-9)
 $Ni(OOCCH_3)_2 \cdot 4H_2O$; FW: 176.80 (248.86); green xtl.; m.p. dec.; d. 1.744

5g

25g

28-1160

HAZ

Nickel(II) chloride hexahydrate (99.999+%-Ni) PURATREM (7791-20-0)
 $NiCl_2 \cdot 6H_2O$; FW: 129.62 (237.70); green xtl.

10g

50g

28-1440

HAZ

Nickel(II) nitrate hexahydrate (99.9985%-Ni) PURATREM (13478-00-7)
 $Ni(NO_3)_2 \cdot 6H_2O$; FW: 182.72 (290.81); green xtl.; m.p. 56.7°; d. 2.05

25g

100g

28-1470

Nickel(II) oxalate dihydrate (99.998%-Ni) PURATREM (6018-94-6)
 $NiC_2O_4 \cdot 2H_2O$; FW: 146.73 (182.76); light green powd.

10g

50g

93-2833

Nickel(II) oxide (99.99%-Ni) PURATREM (1313-99-1)
 NiO ; FW: 74.71; green powd.; m.p. 1990°; d. 6.67

25g

100g

28-1475

Nickel(II) oxide (99.998%-Ni) PURATREM (1313-99-1)
 NiO ; FW: 74.71; greenish-black powd.; m.p. 1990°; d. 6.67

10g

50g

93-2856

Nickel(II) sulfate hexahydrate (99.99%-Ni) PURATREM (10101-97-0)
 $NiSO_4 \cdot 6H_2O$; FW: 154.78 (262.86); green xtl.; d. 2.07

25g

100g

NIObIUM (Compounds)

41-1250

HAZ

Niobium(V) chloride (99.99%-Nb) (20-200ppm Ta) PURATREM (10026-12-7)
 $NbCl_5$; FW: 270.17; yellow xtl.; m.p. 204-206°; b.p. 254°; d. 2.75
moisture sensitive

5g

25g

100g

41-5200

Niobium(V) oxide (99.995%-Nb) (50-100ppm Ta) PURATREM (1313-96-8)
 Nb_2O_5 ; FW: 265.82; white powd.; m.p. 1520°; d. 4.47

25g

100g

OSMIUM (Compounds)

76-2958

amp

HAZ

Osmium(VIII) oxide (99.99+%-Os) PURATREM (20816-12-0)
 OsO_4 ; FW: 254.20; pale yellow xtl.; m.p. 41-42°; d. 4.906

250mg

500mg

1g

5x1g

76-2955

amp

HAZ

Osmium(VIII) oxide (99.99+%-Os), 4% in water PURATREM (20816-12-0)
 OsO_4 ; FW: 254.20; colorless liq.

2ml

5ml

2x5ml

OXYGEN (Compounds)

98-8000

NEW

Water, 99.999% (PURATREM), 98-0295, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (7732-18-5)
 H_2O ; FW: 18.015; colorless liq.; m.p. 0; b.p. 100; d. 1.0

25g

PALLADIUM (Elemental Forms)

93-4630

HAZ

Palladium powder (99.999%) PURATREM (7440-05-3)
Pd; FW: 106.40; -22 mesh; m.p. 1552°; b.p. 3140°; d. 12.02

1g

5g

PALLADIUM (Compounds)

02-1275

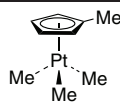
Ammonium tetrachloropalladate(II) (99.998%-Pd) PURATREM (13820-40-1)
See page 2

PHOSPHORUS (Compounds)

93-1588 amp HAZ 	Phosphorus(III) chloride (99.998%-P) PURATREM (7719-12-2)	10g
	PCl ₃ ; FW: 137.33; m.p. -111.8°; b.p. 76°; d. 1.574 <i>moisture sensitive</i>	50g
93-1592 HAZ	Phosphorus(V) oxide (99.99%-P) PURATREM (1314-56-3)	50g
	P ₂ O ₅ ; FW: 141.95; white powdr.; m.p. 580-585°; b.p. 300° subl.; d. 2.39 <i>hygroscopic</i>	250g
97-8875 amp HAZ 	Phosphorus oxychloride, elec. gr. (99.999%-P) PURATREM (10025-87-3)	25g
	POCl ₃ ; FW: 153.35; colorless liq.; m.p. 2°; b.p. 105.3°; d. 1.675 <i>moisture sensitive</i>	100g

PLATINUM (Compounds)

98-1350 NEW	(Trimethyl)methylcyclopentadienylplatinum(IV), 99% (99.999%-Pt) PURATREM (94442-22-5)	500mg
	(CH ₃) ₃ (CH ₃ C ₅ H ₄)Pt; FW: 319.32; off-white powdr.; m.p. 30-31°; b.p. (subl. 23°C/0.053mm); d. 1.88 <i>air sensitive, (store cold)</i>	2g 10g



POTASSIUM (Compounds)

93-1962	Potassium bromide (99.999%-K) PURATREM (7758-02-3)	10g
	KBr; FW: 119.01; white xtl.; m.p. 730°; b.p. 1435°; d. 2.75 <i>hygroscopic</i>	50g
19-2600	Potassium carbonate (99.997%-K) PURATREM (584-08-7)	10g
	K ₂ CO ₃ ; FW: 138.21; white powdr.; m.p. 891°; b.p. dec.; d. 2.428 <i>hygroscopic</i>	50g
93-1977	Potassium chloride, 99+% (99.99+%-K) optical grade PURATREM (7447-40-7)	10g
	KCl; FW: 74.56; white xtl.; m.p. 776°; b.p. 1500° subl.; d. 1.984	50g
93-1978	Potassium chloride (99.999%-K) PURATREM (7447-40-7)	25g
	KCl; FW: 74.56; white xtl.; m.p. 776°; b.p. 1500° subl.; d. 1.984	100g
93-1930	Potassium iodide (99.99%-K) PURATREM (7681-11-0)	10g
	KI; FW: 166.01; white powdr.; m.p. 686°; b.p. 1330°; d. 3.13 <i>hygroscopic</i>	50g
93-4117	Potassium niobate (99.999%-Nb) PURATREM (12030-85-2)	10g
	KNbO ₃ ; FW: 180.01; white powdr.	50g
19-5400 HAZ	Potassium nitrate (99.999%-K) PURATREM (7757-79-1)	25g
	KNO ₃ ; FW: 101.11; white xtl.; m.p. 334°; b.p. 400° dec.; d. 2.109	100g
19-4000	Potassium sulfate (99.999%-K) PURATREM (7778-80-5)	2g
	K ₂ SO ₄ ; FW: 174.27; white xtl.	10g 50g
93-7906	Potassium tetrachloroaurate(III) hydrate (99.99%-Au) (51%-Au) PURATREM (13682-61-6)	1g
	KAuCl ₄ ·xH ₂ O; FW: 377.88; yellow to orange xtl.	5g

PRASEODYMIUM (Compounds)

93-5910	Praseodymium(III,IV) oxide (99.99%-Pr) (REO) PURATREM (12037-29-5)	1g
	Pr ₆ O ₁₁ ; FW: 1021.43; black powdr.	5g 25g

RHENIUM (Elemental Forms)

75-1890 HAZ	Rhenium powder (99.99%) PURATREM (7440-15-5)	1g
	Re; FW: 186.20; -325 mesh powdr.; SA: high; m.p. 3180°; b.p. 5900°; d. 21.04	5g

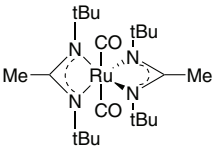
RHENIUM (Compounds)

02-0900	Ammonium perrhenate (99.999%-Re) PURATREM (13598-65-7) See page 1	
93-7501 HAZ	Perrhenic acid, aqueous solution (50-54% Re) (99.99%-Re) PURATREM (13768-11-1) HReO ₄ ; FW: 251.26; colorless liq.	2g 10g 50g
93-7505 HAZ	Rhenium(VII) oxide (99.99%-Re) PURATREM (1314-68-7) Re ₂ O ₇ ; FW: 484.40; yellow to pale green powdr.; m.p. ~297°; b.p. 250° subl.; d. 6.103 <i>hygroscopic</i>	1g 5g

RHODIUM (Compounds)

02-0590	Ammonium hexachlororhodate(III) monohydrate (99.995%-Rh) PURATREM (15336-18-2) See page 1	
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RUTHENIUM (Compounds)

44-0056 NEW amp	Bis(N,N'-di-tert-butylacetamidinato)ruthenium(II) dicarbonyl, 98% (99.99%-Ru) PURATREM (949113-49-9) C ₂₂ H ₄₂ N ₄ O ₂ Ru; FW: 495.67; Beige to yellow solid; m.p. 204 <i>air sensitive, moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2	1g 5g
		
44-5885 NEW HAZ	Ruthenium(III) chloride hydrate (40-43% Ru) (99.99+%-Ru) PURATREM [free of Ru(II) and Ru(IV) by electrochemical analysis] (14898-67-0) RuCl ₃ ·xH ₂ O; FW: 207.43; black powdr. <i>hygroscopic</i>	1g 5g

SAMARIUM (Compounds)

93-6231	Samarium(III) oxide (99.99+%-Sm) (REO) PURATREM (12060-58-1) Sm ₂ O ₃ ; FW: 348.70; white to off-white powdr.; d. 8.347	5g 25g
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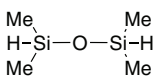
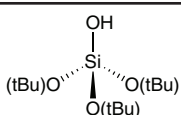
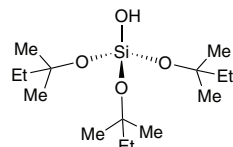
SCANDIUM (Compounds)

93-2110	Scandium(III) carbonate hydrate (99.99%-Sc) (REO) PURATREM (5809-49-4) Sc ₂ (CO ₃) ₃ ·xH ₂ O; FW: 269.96; white powdr.	1g 5g
93-2102	Scandium (III) chloride, anhydrous (99.99%-Sc) (REO), sublimed, PURATREM (10361-84-9) ScCl ₃ ; FW: 151.32; white powdr.; m.p. 939°; d. 2.39 <i>hygroscopic</i>	250mg 1g 5g
21-2112	Scandium(III) oxide (99.99%-Sc) (REO) PURATREM (12060-08-1) Sc ₂ O ₃ ; FW: 137.91; white powdr. (~7 micron); d. 3.864	1g 5g 25g

SELENIUM (Compounds)

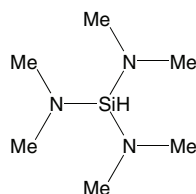
93-3405 HAZ	Selenium(IV) oxide (99.999%-Se) PURATREM (7446-08-4) SeO ₂ ; FW: 110.96; off-white powdr.; b.p. 340-350° subl.; d. 3.95	5g 25g
34-0100 HAZ	Selenous acid (99.999%-Se) PURATREM (7783-00-8) H ₂ SeO ₃ ; FW: 128.97; white xtl.; m.p. 70° dec.; d. 3.004 <i>hygroscopic</i>	25g 100g

SILICON (Compounds)

14-1072 NEW HAZ	Bis(t-butylamino)silane, BTBAS (99.999%-Si) PURATREM (186598-40-3) $C_8H_{22}N_2Si$; FW: 174.36; colorless liq.; b.p. 167°C; f.p. 30°C; d. 0.816 <i>moisture sensitive</i>	1g 5g 25g
98-8810 NEW HAZ	Bis(diethylamino)silane, 99% (99.999%-Si) BDEAS PURATREM (27804-64-4) $SiH_2[N(CH_2CH_3)_2]_2$; FW: 174.36; colorless liq. <i>air sensitive, moisture sensitive</i>	5g 25g
14-1955 NEW HAZ	Hexakis(ethylamino)disilane (99.995%-Si) PURATREM (532980-53-3) $(C_2H_5NH)_6Si_2$; FW: 320.63; colorless liq.; m.p. -7°; b.p. 257°; d. 1.0 <i>moisture sensitive</i>	1g 5g
14-1445 NEW HAZ	Silicon(IV) bromide, (99.99% Si) PURATREM (7789-66-4) $SiBr_4$; FW: 347.72; colorless liq.; m.p. 5.4°; b.p. 154°; d. 2.772 <i>moisture sensitive</i>	5g 25g
98-0147 HAZ	Silicon(IV) chloride, fiber optic grade (99.9999%-Si, 50ppm-Fe) PURATREM (10026-04-7) $SiCl_4$; FW: 169.90; colorless liq.; m.p. -70°; b.p. 57.6°; d. 1.483 <i>moisture sensitive</i> Note: Available prepacked in ALD cylinder- see 98-4027.	100g 500g
98-4027 HAZ	Silicon(IV) chloride, fiber optic grade (99.9999%-Si, 50ppm-Fe) PURATREM, 98-0147, contained in a 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (10026-04-7) $SiCl_4$; FW: 169.90; colorless liq.; m.p. -70°; b.p. 57.6°; d. 1.483 <i>moisture sensitive</i>	50g
14-7423 NEW	Silicon nitride, 0.2-2.5 microns (99.99%-Si) PURATREM (12033-89-5) Si_3N_4 ; FW: 140.28; light gray pwdr.	50g 250g
98-0145	Silicon(IV) oxide, elec. gr. (99.999%-Si) PURATREM (7631-86-9) SiO_2 ; FW: 60.09; white pwdr.; m.p. 1500°; d. 2.6	5g 25g 100g
14-7025 NEW HAZ	1,1,3,3-Tetramethyldisiloxane, 99+% TMDSO (99.9999%-Si) PURATREM (3277-26-7) $C_4H_{14}OSi_2$; FW: 134.32; colorless liq.; b.p. 70-71°; f.p. -26°C; d. 0.76 <i>moisture sensitive</i>	 25g 100g
14-7015	Tri-t-butoxysilanol (99.999%-Si) PURATREM (18166-43-3) $[(CH_3)_3CO]_3SiOH$; FW: 264.43; white liquid to semi-solid; m.p. 63-65° <i>moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 . Available prepacked in ALD cylinder- see 98-6025.	 1g 5g
98-6025	Tri-t-butoxysilanol (99.999%-Si) PURATREM 14-7015 contained in 50 ml Swagelok® cylinder (96-1077) for CVD/ALD (18166-43-3) $[(CH_3)_3CO]_3SiOH$; FW: 264.43; white solid <i>moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 .	25g
14-7020	Tri-t-pentoxysilanol (99.999%-Si) PURATREM (17906-35-3) $[CH_2CH_2C(CH_3)_2O]_3SiOH$; FW: 306.51; colorless liq. <i>moisture sensitive</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 . ***Limited quantities available.***	 1g 5g

SILICON (Compounds)

14-8750 **Tris(dimethylamino)silane, 99+%, 3DMAS**
HAZ **(99.999%-Si) PURATREM (15112-89-7)**
 [(CH₃)₂N]₃SiH; FW: 161.32; colorless to light yellow liq.;
 b.p. 145-148° (4°/16mm); f.p. 77°F; d. 0.84
 Note: Available prepacked in ALD cylinder- see 98-4035.



5g
25g

Technical Note:

1. Silicon precursor for the atomic layer deposition (ALD) and CVD of silicon containing thin films.

References:

1. *Nanoscale Research Letters*, **2017**, 12, 370.
2. *Journal of the Korean Physical Society*, **2015**, 67(12), 2115-2119.
3. *Journal of Materials Science: Materials in Electronics*, **2012**, 23, 2075.

98-4035 **Tris(dimethylamino)silane, 99+%, 3DMAS (99.999%-Si) PURATREM 14-8750,**
HAZ **contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (15112-89-7)**
 [(CH₃)₂N]₃SiH; FW: 161.32; colorless to light yellow liq.; b.p. 145-148° (4°/16mm);
 f.p. 77°F; d. 0.84
air sensitive, moisture sensitive

25g

SILVER (Compounds)

47-1325 **Silver nitrate (99.9995%-Ag) PURATREM (7761-88-8)**
HAZ AgNO₃; FW: 169.87; white xtl.; m.p. 212°; b.p. 444° dec.; d. 4.352

10g
50g

93-4743 **Silver(I) oxide, 99+% (99.99%-Ag) PURATREM (20667-12-3)**
HAZ Ag₂O; FW: 231.74; black powdr.; m.p. 300° dec.; d. 7.143

10g
50g

47-1700 **Silver perrhenate, 99% (99.995%-Re) PURATREM (20654-56-2)**
HAZ AgReO₄; FW: 358.07; white powdr.; m.p. 430°; d. 7.05

1g
5g

93-4733 **Silver telluride (99.99%-Ag/Te) PURATREM (12002-99-2)**
HAZ Ag₂Te; FW: 343.34; black xtl.; m.p. 955°; d. 8.5

1g
5g

SODIUM (Compounds)

93-1121 **Sodium bromide (99.999%-Na) PURATREM (7647-15-6)**
HAZ NaBr; FW: 102.90; white xtl.; m.p. 755°; b.p. 1390°; d. 3.203
hygroscopic

10g
50g

11-1100 **Sodium chloride (99.999%-Na) PURATREM (7647-14-5)**
HAZ NaCl; FW: 58.44; white xtl.; m.p. 801°; b.p. 1413°; d. 2.165

10g
50g
250g

11-2000 **Sodium fluoride (99.99+%-Na) PURATREM (7681-49-4)**
HAZ NaF; FW: 41.99; white powdr.; m.p. 988°; b.p. 1695°; d. 2.558

25g
100g

11-1146 **Sodium hexafluorophosphate 99% (99.99%-Na) PURATREM (21324-39-0)**
NEW F₆NaP; FW: 167.95; white powdr.; d. 2.37
air sensitive, moisture sensitive, hygroscopic

2g
10g

11-1147 **Sodium hexafluorophosphate 99% (99.99%-Na) PURATREM (<10ppm H₂O)**
NEW (21324-39-0)
HAZ F₆NaP; FW: 167.95; white powdr.
air sensitive, moisture sensitive, hygroscopic
 Note: Suitable for battery applications

1g
5g

93-1064 **Sodium hydroxide monohydrate (99.99%-Na) PURATREM (12179-02-1)**
HAZ NaOH·H₂O; FW: 40.00 (58.01); white xtl.
hygroscopic

10g
50g

93-1069 **Sodium sulfate, anhydrous (99.999%-Na) PURATREM (7757-82-6)**
HAZ Na₂SO₄; FW: 142.04; white powdr.; m.p. 888°; d. 2.68

10g
50g

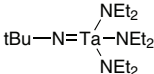
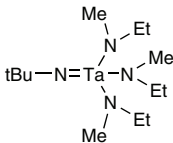
93-1072 **Sodium tetraborate, anhydrous (99.998%-B) (50 ppm K) PURATREM (1330-43-4)**
HAZ Na₂B₄O₇; FW: 201.22; white powdr.; m.p. 741°; b.p. 1575° dec.; d. 2.367

10g
50g

STRONTIUM (Compounds)

38-1010	Bis(2,2,6,6-tetramethyl-3,5-heptanedionato)strontium tetraglyme adduct (99.99%-Sr) PURATREM (150939-76-7) Sr(C ₁₁ H ₁₉ O ₂) ₂ ·CH ₃ (OCH ₂ CH ₂) ₄ OCH ₃ ; FW: 454.16 (676.44); white xtl.; m.p. 75° Note: This compound is covered by U.S. Patent No. 5,225,561, and is manufactured and sold under license from Advanced Technology Materials, Inc., Danbury, CT.	1g 5g
38-1015	Bis(2,2,6,6-tetramethyl-3,5-heptanedionato)strontium triglyme adduct (99.99%-Sr) PURATREM Sr(C ₁₁ H ₁₉ O ₂) ₂ ·CH ₃ (OCH ₂ CH ₂) ₃ OCH ₃ ; FW: 454.16 (632.39); white xtl.; m.p. 102° Note: This compound is covered by U.S. Patent No. 5,225,561, and is manufactured and sold under license from Advanced Technology Materials, Inc., Danbury, CT.	1g 5g
38-3838	Strontium bis(N,N,N',N',N"-pentamethyldiethylenetriamine)bis[BREW] (99.99+%-Sr) PURATREM Sr(C ₉ H ₂₃ N ₃) ₂ [C·HyC(O)CHC(O)C·Hy] ₂ (x=3-4, y=2x+1); pale yellow liq. <i>moisture sensitive</i> Note: 9-11 wt% Sr, ***Limited quantities available. Will discontinue when stock gone***	1g 5g
Technical Note: 1. See 56-5656 (page 2)		
38-1100	Strontium carbonate (99.995%-Sr) PURATREM (1633-05-2) SrCO ₃ ; FW: 147.63; white powdr.; m.p. 1497°; d. 3.70	10g 50g
93-3843	Strontium fluoride (99.99%-Sr) PURATREM (7783-48-4) SrF ₂ ; FW: 125.62; white powdr.; m.p. > 1450°; b.p. 2489°; d. 4.24 <i>hygroscopic</i>	10g 50g

TANTALUM (Compounds)

73-0723	(t-Butylimido)tris(diethylamino)tantalum(V), min. 98% (99.99%-Ta) PURATREM TBTDET (169896-41-7) C ₁₆ H ₃₀ N ₄ Ta; FW: 468.45; colorless to pale yellow liq.; d. 1.252 g/ml@25°C <i>air sensitive, moisture sensitive</i>		250mg 1g 5g
Technical Note: 1. Useful precursor for the atomic layer deposition of tantalum oxide and tantalum nitride.			
References: 1. <i>Journal of Nanosci. and Nanotechnol.</i> , 2013 , 13, 4097. 2. <i>Semicond. Sci. Tech.</i> , 2012 , 27, 074003/1. 3. <i>Chem. Vapor Depos.</i> , 2011 , 17, 37. 4. <i>Electrochem. Solid St.</i> , 2010 , 13, H426. 5. <i>J. Electrochem. Soc.</i> , 2010 , 157, H652. 6. <i>J. Electrochem. Soc.</i> , 2009 , 156, H852.			
73-0735	(t-Butylimido)tris(ethylmethylamino)tantalum(V) (99.99%-Ta) PURATREM (511292-99-2) C ₁₃ H ₃₃ N ₄ Ta; FW: 426.38; yellow liq. <i>air sensitive, moisture sensitive</i>		1g 5g 25g
73-0950	Tantalum(V) n-butoxide (99.99+%-Ta) PURATREM (51094-78-1) HAZ C ₂₀ H ₄₅ O ₅ Ta; FW: 546.52; colorless to light yellow liq.; d. 1.31 <i>air sensitive, moisture sensitive</i>		5g 25g

Technical Notes:

1. Precursor used for the sol-gel deposition of NaTaO₃ thin films.
2. Precursor used for the sol-gel deposition of Tantalum doped TiO₂.
3. Used for the synthesis of Tantalum oxide nanoparticles.

References:

1. *RSC Advances*, **2012**, 2, 5130.
2. *J. Mat. Res.*, **2011**, 26, 2653.
3. *Journal of Solid State Chemistry*, **2013**, 199, 15 – 20.

TANTALUM (Compounds)

93-7324 amp HAZ	Tantalum(V) chloride, resublimed (99.99+%-Ta) PURATREM (7721-01-9) TaCl ₅ ; FW: 358.21; white powdr.; m.p. 216° (subl. 144°); b.p. 242°; d. 3.68 <i>moisture sensitive</i>	10g 50g
93-7303 amp HAZ	Tantalum(V) ethoxide (99.99+%-Ta) PURATREM (6074-84-6) Ta(OC ₂ H ₅) ₅ ; FW: 406.26; colorless to yellow liq.; m.p. 21°; b.p. 145°/0.1 mm; f.p. 87°F; d. 1.56 <i>moisture sensitive</i>	10g 50g 5 x 50g
73-1080 amp HAZ	Tantalum(V) ethoxide (99.9999%-Ta) PURATREM (6074-84-6) Ta(OC ₂ H ₅) ₅ ; FW: 406.26; yellow liq.; m.p. 21°; b.p. 145°/0.1mm; f.p. 87°F; d. 1.56 <i>moisture sensitive</i> Note: Limited quantities available.	1g
93-7329 HAZ	Tantalum(V) methoxide (99.99+%-Ta) PURATREM (865-35-0) Ta(OCH ₃) ₅ ; FW: 336.12; white powdr.; m.p. 50°; b.p. 189°/10 mm <i>moisture sensitive</i>	2g 10g
93-7306	Tantalum(V) oxide, 99.8% (99.99+%-Ta) PURATREM (1314-61-0) Ta ₂ O ₅ ; FW: 441.89; white powdr.; m.p. 1800°; d. 8.2	10g 50g
73-5000 HAZ	Tantalum(V) (tetraethoxy)(acetylacetonate) (99.99+%-Ta) PURATREM (20219-33-4) Ta(OC ₂ H ₅) ₄ (CH ₃ COCHCOCH ₃); FW: 460.30; yellow solid; m.p. 45°; b.p. 95°/0.5mm; d. 1.5 <i>moisture sensitive</i>	10g 50g
73-7373	Tantalum(V) (tetraethoxy)[BREW] (99.99+%-Ta) PURATREM Ta(C ₂ H ₅ O) ₄ [C _x H _y C(O)CHC(O)C _x H _y] ₂ (x=3-4, y=2x+1); pale brown liq. <i>moisture sensitive</i> Note: ***Limited quantities available. Will discontinue when stock gone***	1g 5g

TELLURIUM (Compounds)

93-5216	Tellurium(IV) oxide (99.999%-Te) PURATREM (7446-07-3) TeO ₂ ; FW: 159.60; off-white powdr.; m.p. 733°; b.p. 450° subl.	10g 50g
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TERBIUM (Compounds)

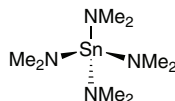
65-6502	Terbium(III) chloride hydrate (99.995%-Tb) (REO) PURATREM (13798-24-8) TbCl ₃ ·xH ₂ O; FW: 265.29; white xtl.	5g 25g
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THALLIUM (Compounds)

93-8103 HAZ	Thallium(I) bromide (99.999%-Tl) PURATREM (7789-40-4) TlBr; FW: 284.28; yellow powdr.; m.p. 480°; b.p. 815°; d. 7.557	10g 50g
93-8108 HAZ	Thallium(I) iodide (99.999%-Tl) PURATREM (7790-30-9) TlI; FW: 331.27; yellow powdr.; m.p. 440°; b.p. 823°; d. 7.09	5g 25g
81-6750 HAZ	Thallium(I) nitrate (99.99%-Tl) PURATREM (10102-45-1) TlNO ₃ ; FW: 266.37; white xtl.; m.p. 206°; b.p. 430°	10g 50g 250g
81-8100 HAZ	Thallium(III) oxide (99.99%-Tl) PURATREM (1314-32-5) Tl ₂ O ₃ ; FW: 456.74; black powdr.; m.p. ~717°	10g 50g
81-8200 HAZ	Thallium(I) sulfate (99.999%-Tl) PURATREM (7446-18-6) Tl ₂ SO ₄ ; FW: 504.80; white xtl.; m.p. 632°; b.p. dec.; d. 6.77	5g 25g

TIN (Compounds)

50-1815 amp HAZ	Tetrakis(dimethylamino)tin(IV), 99% (99.99%-Sn) TDMASn PURATREM (1066-77-9) Sn[N(CH ₃) ₂] ₄ ; FW: 295.01; colorless to pale-yellow liq.; b.p. 51° (0.1mm); d. 1.169 g/cm ³ <i>moisture sensitive</i> Note: Available prepacked in ALD cylinder- see 98-4050.	1g 5g 25g
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Technical Note:

1. ALD precursor for tin.

References:

1. *Chem. Mater.*, **1992**, 4, 68
2. *Chem. Mater.*, **1994**, 6, 360
3. *Chem. Mater.*, **2014**, 26, 2795

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TIN (Compounds)

98-4050 HAZ	Tetrakis(dimethylamino)tin(IV), 99% (99.99%-Sn) TDMASn PURATREM, 50-1815, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD (1066-77-9) Sn[N(CH ₃) ₂] ₄ ; FW: 295.01; colorless to pale-yellow liq.; b.p. 51° (0.1mm); d. 1.169g/cm ³ <i>moisture sensitive</i>	10g 25g
50-2100	Tin(IV) t-butoxide (99.99%-Sn) PURATREM (36809-75-3) Sn(OC ₄ H ₉) ₄ ; FW: 411.17; white solid to turbid colorless liq.; m.p. 45°; b.p. 65°/0.3mm; d. 1.06 <i>moisture sensitive</i>	1g 5g 25g
50-5022  HAZ	Tin(IV) chloride, anhydrous (99.99%-Sn%) PURATREM (7646-78-8) SnCl ₄ ; FW: 260.50; colorless liq.; m.p. -33°; b.p. 114.1°C; d. 2.226 <i>air sensitive, moisture sensitive</i>	5g 25g
50-2500	Tin(IV) oxide (99.998%-Sn) PURATREM (18282-10-5) SnO ₂ ; FW: 150.69; -22 mesh off-white powdr.; m.p. 1630°; d. 7.0	5g 25g

TITANIUM (Compounds)

22-2240  HAZ	Tetrakis(dimethylamino)titanium(IV), 99% TDMAT (99.99%-Ti) PURATREM (3275-24-9) Ti[N(CH ₃) ₂] ₄ ; FW: 224.20; yellow to orange liq.; f.p. -22°F <i>air sensitive, moisture sensitive</i>	1g 5g 25g
22-1060  amp HAZ	Tetrakis(ethylmethylamino)titanium, 99% (99.99%-Ti) PURATREM (308103-54-0) C ₁₂ H ₃₂ N ₄ Ti; FW: 280.28; yellow to orange liq.; b.p. 80°/1 mm <i>moisture sensitive</i>	2g 10g
22-2222	Titanium(IV) (di-i-propoxide)bis[BREW] (99.99+%-Ti) PURATREM Ti(OC ₃ H ₇) ₂ [C ₈ H ₈ C(O)CHC(O)C ₈ H ₈] ₂ (x=3-4, y=2x + 1); red-orange liq. <i>moisture sensitive</i> Note: 8-11 wt% Ti, ***Limited quantities available. Will discontinue when stock gone***	1g 5g
22-2209 amp HAZ	Titanium(IV) ethoxide (99.99%-Ti) PURATREM (3087-36-3) Ti(OC ₂ H ₅) ₄ ; FW: 228.14; xtl. to pale orange liq.; m.p. 54°; b.p. 138°/5mm; f.p. 84°F; d. 1.088 <i>moisture sensitive</i>	5g 25g
93-2223 HAZ	Titanium(IV) iodide (99.99%-Ti) PURATREM (7720-83-4) TiI ₄ ; FW: 555.52; black xtl.; m.p. 150°; b.p. 377.1°; d. 4.3 <i>moisture sensitive</i>	1g 5g
93-2207	Titanium(IV) oxide (99.99+%-Ti) PURATREM (13463-67-7) TiO ₂ ; FW: 79.90; white powdr.; m.p. 1830-1850°; b.p. 2500-3000°; d. 4.26	25g 100g
22-1155  HAZ 	Titanium(IV) chloride, (99.99+%-Ti) PURATREM (7550-45-0) TiCl ₄ ; FW: 189.73; pale yellow liq.; m.p. -25°; b.p. 136°; d. 1.726 <i>air sensitive, moisture sensitive</i>	50g

TUNGSTEN (Compounds)

74-3105	Tungsten(VI) oxide (99.995%-W) PURATREM (1314-35-8) WO ₃ ; FW: 231.85; yellow powdr.; m.p. 1473°; d. 7.16	10g 50g
93-7411	Tungsten(VI) oxide, sintered lumps (99.99%-W) PURATREM (1314-35-8) WO ₃ ; FW: 231.85; yellowish-green pieces; m.p. 1473°; d. 7.16	10g 50g

VANADIUM (Compounds)

93-2337 HAZ	Vanadium(V) oxide (99.99%-V) PURATREM (1314-62-1) V ₂ O ₅ ; FW: 181.88; -22 mesh orange powdr.; m.p. 690°; b.p. 1750° dec.; d. 3.357	5g 25g
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YTTERBIUM (Compounds)

70-7003	Ytterbium(III) chloride hydrate (99.99+%-Yb) (REO) PURATREM (19423-87-1) YbCl ₃ ·XH ₂ O; FW: 279.40; white xtl.; d. 2.575	5g 25g
70-7004	Ytterbium(III) fluoride (99.99%-Yb) (REO) PURATREM (13760-80-0) YbF ₃ ; FW: 230.04; white powdr.; m.p. 1157°; b.p. 2200°; d. 8.168 <i>hygroscopic</i>	5g 25g

PURATREM™ - High Purity Inorganics

YTTRIUM (Compounds)

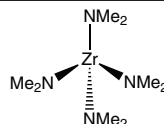
39-2940 HAZ	Yttrium(III) nitrate hexahydrate (99.999%-Y) (REO) PURATREM (13494-98-9) $Y(NO_3)_3 \cdot 6H_2O$; FW: 274.92 (383.01); white xtl.	25g 100g
93-3910	Yttrium(III) oxide (99.99%-Y) (REO) PURATREM (1314-36-9) Y_2O_3 ; FW: 225.81; white powdr.; m.p. 2410°; d. 5.01	50g 250g
93-3925	Yttrium(III) oxide (99.999%-Y) (REO) PURATREM (1314-36-9) Y_2O_3 ; FW: 225.81; white powdr.; m.p. 2410°; d. 5.01	10g 50g 1kg
39-2980	Yttrium(III) phosphate hydrate (99.99%-Y) (REO) PURATREM (34054-55-2) $YPO_4 \cdot xH_2O$; FW: 183.88; white powdr.	5g 25g

ZINC (Compounds)

97-4525 HAZ 	Diethylzinc, elec. gr. (99.9998%-Zn) PURATREM (557-20-0) $Zn(C_2H_5)_2$; FW: 123.49; colorless liq.; m.p. -28°; b.p. 124°; f.p. -1°F; d. 1.18 <i>moisture sensitive, pyrophoric</i>	100g
97-5060 HAZ 	Dimethylzinc, elec. gr. (99.999%-Zn) PURATREM (544-97-8) $Zn(CH_3)_2$; FW: 95.44; colorless liq.; m.p. -42°; b.p. 46°; f.p. -1°F; d. 1.386 (20°) <i>moisture sensitive, pyrophoric</i> Note: Available prepacked in ALD cylinder- see 98-4002.	50g 100g
98-4002 HAZ 	Dimethylzinc, elec. gr. (99.999%-Zn) PURATREM, 97-5060, contained in 50 ml electropolished Swagelok® cylinder (96-1077) for CVD/ALD (544-97-8) $Zn(CH_3)_2$; FW: 95.44; colorless liq.; m.p. -42°; b.p. 46°; f.p. -1°F; d. 1.386 (20°) <i>moisture sensitive, pyrophoric</i>	10g
30-3033 HAZ	Zinc bromide (99.999%-Zn) PURATREM (7699-45-8) $ZnBr_2$; FW: 225.19; white powdr.; m.p. 394°; b.p. 650°; d. 4.201 <i>hygroscopic</i>	5g 25g
93-3052 amp HAZ	Zinc chloride (99.99%-Zn) PURATREM (7646-85-7) $ZnCl_2$; FW: 136.28; -10 mesh spheres; m.p. 283°; b.p. 732°; d. 2.91	10g 50g
93-3016	Zinc oxide (99.999%-Zn) PURATREM (1314-13-2) ZnO ; FW: 81.37; white powdr.; m.p. 1975°; d. 5.606	10g 50g
93-3041	Zinc selenide (99.99%-Zn) PURATREM (1315-09-9) $ZnSe$; FW: 144.33; yellow, granular solid; m.p. > 1100°; d. 5.42	5g 25g 100g
93-3023	Zinc selenide (99.999%-Zn) PURATREM (1315-09-9) $ZnSe$; FW: 144.33; yellow powdr.; m.p. > 1100°; d. 5.42	10g 50g
30-3024	Zinc sulfide (99.99%-Zn) (fused granules) PURATREM (1314-98-3) ZnS ; FW: 97.43; 2.5-5.0mm granules; m.p. 1700°; d. 4.10	5g 25g 100g
93-3046	Zinc telluride (99.99%-Zn) PURATREM (1315-11-3) $ZnTe$; FW: 192.97; gray powdr.; m.p. 1240°; d. 6.34	10g 50g

ZIRCONIUM (Compounds)

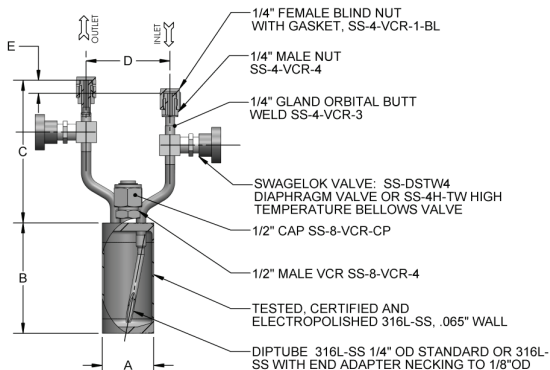
40-4115  amp HAZ	Tetrakis(dimethylamino)zirconium(IV), 99% (99.99%-Zr) PURATREM TDMAZ (19756-04-8) $Zr[N(CH_3)_2]_4$; FW: 267.53; light-yellow xtl.; m.p. 57-60°; b.p. 80° (0.1mm) <i>moisture sensitive, (store cold)</i> Note: Product sold under, use subject to, terms and conditions of label license at www.strem.com/harvard1 .	1g 5g 25g
40-1750 amp	Zirconium(IV) t-butoxide (99.99%-Zr) PURATREM (2081-12-1) $Zr(OC_4H_9)_4$; FW: 383.68; slightly yellow liq.; b.p. 90°/5mm; f.p. 185°F; d. 0.96 <i>moisture sensitive, (store cold)</i>	2g 10g 2 x 25g
40-2500 HAZ	Zirconium(IV) dichloride oxide hydrate (99.99+%-Zr) PURATREM (15461-27-5) $ZrOCl_2 \cdot xH_2O$; FW: 178.13; white xtl.	25g 100g
40-4750	Zirconium(IV) sulfate tetrahydrate (99.99+%-Zr) PURATREM (7446-31-3) $Zr(SO_4)_4 \cdot 4H_2O$; FW: 283.33 (355.39); white xtl.; m.p. 100° (-3H ₂ O)	25g 100g



Chemical Vapor Deposition / Atomic Layer Deposition (CVD/ALD) Equipment

STAINLESS STEEL BUBBLERS:

Vertical, Electropolished with fill-port, DOT4B, UN Stamped



Stainless Steel Bubblers, vertical, electropolished with fill-port, PCTFE valve stem tip (121°C), DOT 4B, UN stamped

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	E mm	Temp. Valve	Special Configuration
95-4151	150	51	108	143	83	13	Standard	
95-4290	300	51	187	143	83	13	Standard	
95-4598	600	76	164	143	83	13	Standard	
95-4998	1000	76	254	143	83	13	Standard	
95-5002	1200	102	184	143	83	13	Standard	
95-5003	1500	102	223	143	83	13	Standard	
95-5001	2000	102	292	143	83	13	Standard	
95-5011	3000	152	213	140	83	13	Standard	
95-3000	150	51	108	140	83	13	Standard	replaceable-seat valves with rotated handles
95-4153	150	51	108	143	83	13	Standard	with rotated handles

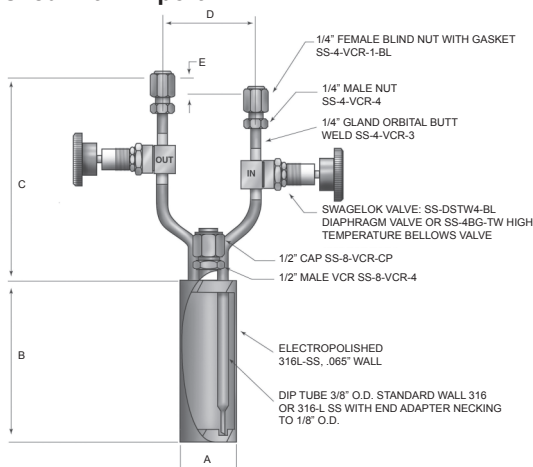
Stainless Steel Bubblers, vertical, electropolished with fill-port, high temperature valves (315°C), DOT 4B, UN stamped

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	E mm	Temp. Valve	Special Configuration
95-0271	150	51	108	140	83	13	High	
95-0270	300	51	187	140	83	13	High	
95-4599	600	76	164	140	83	13	High	
95-4002	1200	102	184	143	83	13	High	
95-4155	150	51	108	140	83	13	High	with rotated handles
95-0276	150	51	108	140	83	13	High	with short dip tube, cut to 1 inch from top of bubbler
95-4157	200	51	150	140	83	13	High	with rotated handles
95-0280	300	51	187	140	83	13	High	with rotated handles
95-4295	300	51	187	140	83	13	High	with rotated handles, no dip tube
95-4610	600	76	164	127	83	13	High	with rotated handles, no dip tube , stems same height

Chemical Vapor Deposition / Atomic Layer Deposition (CVD/ALD) Equipment

STAINLESS STEEL BUBBLERS:

Vertical, Electropolished with fill-port



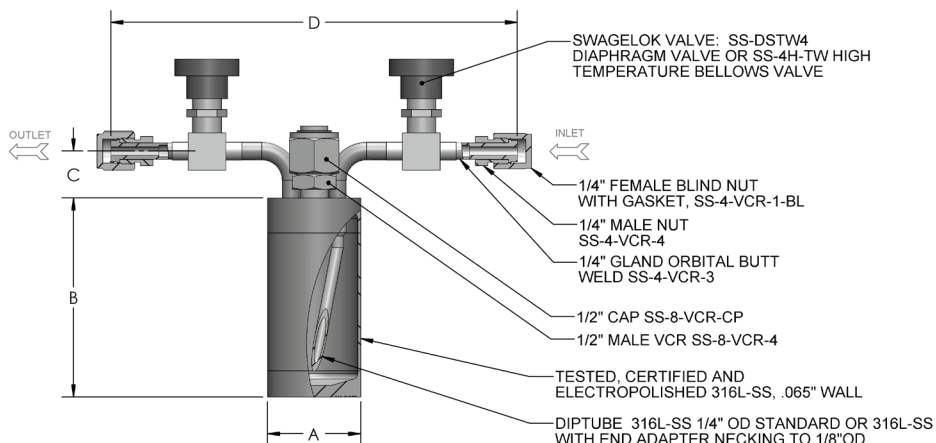
Stainless Steel Bubblers, vertical, electropolished with fill-port, PCTFE valve stem tip (121°C)								
Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	E mm	Temp. Valve	Special Configuration
96-4151	150	51	108	140	83	13	Standard	
96-4290	300	51	187	140	83	13	Standard	
96-4598	600	76	163	140	83	13	Standard	
96-4998	1000	76	254	140	83	13	Standard	
96-5002	1000	102	165	140	83	13	Standard	
96-5003	1400	102	203	140	83	13	Standard	
96-5001	1800	102	254	140	83	13	Standard	
96-5011	2750	152	188	140	83	13	Standard	
96-4149	150	51	108	140	83	13	Standard	with short dip tube, cut 5cm from top of bubbler
96-4153	150	51	108	140	83	13	Standard	with rotated handles

Stainless Steel Bubblers, vertical, electropolished with fill-port, high temperature valves (315°C)								
Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	E mm	Temp. Valve	Special Configuration
98-0271	150	51	108	140	83	13	High	
98-0270	300	51	187	140	83	13	High	
96-4599	600	76	163	140	83	13	High	
96-4996	1000	76	254	140	83	13	High	
98-0276	150	51	108	140	83	13	High	with short dip tube, cut to 1 inch from top of bubbler
98-0280	300	51	187	140	83	13	High	with rotated handles
96-4295	300	51	187	140	83	13	High	with rotated handles, no dip tube
96-4610	600	76	163	140	83	13	High	with rotated handles, no dip tube , stems same height

Chemical Vapor Deposition / Atomic Layer Deposition (CVD/ALD) Equipment

STAINLESS STEEL BUBBLERS:

Horizontal, Electropolished with fill-port, DOT4B, UN Stamped



Stainless Steel Bubblers, horizontal, electropolished with fill-port, PCTFE valve stem tip (121°C) DOT 4B, UN stamped

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	Temp. Valve	Special Configuration
95-5151	150	51	108	24	222	Standard	
95-5298	300	51	187	24	222	Standard	
95-5599	600	76	164	24	222	Standard	
95-5998	1000	76	254	24	222	Standard	
95-5004	2000	152	152	24	222	Standard	
95-0273	150	51	108	24	222	Standard	with reversed handles

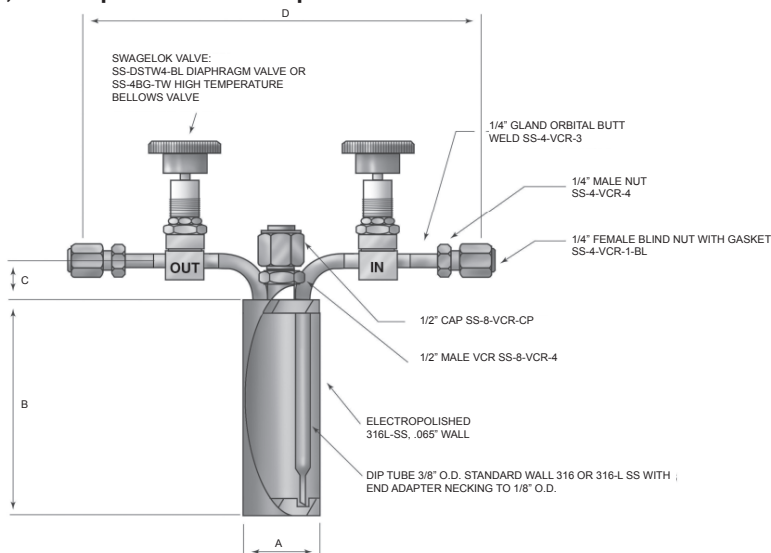
Stainless Steel Bubblers, horizontal, electropolished with fill-port, high temperature valves (315°C) DOT 4B, UN stamped

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	Temp. Valve	Special Configuration
95-0272	150	51	108	24	222	High	
95-5006	300	51	187	24	222	High	
95-5007	600	76	164	24	222	High	
95-5008	1000	76	254	24	222	High	

Chemical Vapor Deposition / Atomic Layer Deposition (CVD/ALD) Equipment

STAINLESS STEEL BUBBLERS:

Horizontal, Electropolished with fill-port



Stainless Steel Bubblers, horizontal, electropolished with fill-port, PCTFE valve stem tip (121°C)

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	Temp. Valve	Special Configuration
96-5151	150	51	108	24	222	Standard	
96-5298	300	51	187	24	222	Standard	
96-5599	600	76	163	24	222	Standard	
96-5998	1000	76	254	24	222	Standard	
96-5004	1800	102	254	24	222	Standard	
98-0273	150	51	108	24	222	Standard	with reversed handles
98-0275	150	51	108	24	222	Standard	with rotated handles

Stainless Steel Bubblers, horizontal, electropolished with fill-port, high temperature valves (315°C)

Catalog #	Vol. (mL)	A mm	B mm	C mm	D mm	Temp. Valve	Special Configuration
98-0272	150	51	108	24	222	High	
96-5006	300	51	187	24	222	High	
96-5007	600	76	163	24	222	High	
96-5008	1000	76	254	24	222	High	

Swagelok® Cylinder Assemblies for ALD

Standard Assembly

96-1070 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male Ball Valve and Female Nut for CVD/ALD

1/4" VCR Male Ball Valve rated to 300°F or 148°C

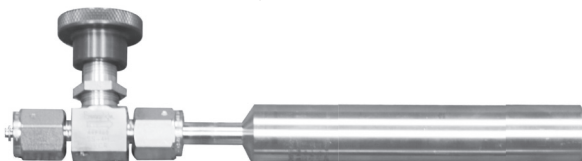


Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, 50ml	Cylinder Body	Standard	SC-11	---
Swagelok® 1/4" Male Ball Valve, VCR Metal Gasket Face Seal Fitting	Valves	Standard	SC-10	300°F 148°C
Swagelok® 1/4" Female Nut	Female Nut	Standard	SC-10	---
Swagelok® Stainless 1/4" VCR Silver Plated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Silver plated	N/A	---

High-Temp Valve Assembly

96-1071 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male Bellows-Sealed Valve (High Temp) and Female Nut for CVD/ALD

1/4" VCR Male Bellows-Sealed Valve (High Temp/EP) rated to 600°F or 315°C



Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, 50ml	Cylinder Body	Standard	SC-11	---
Swagelok® 1/4" Male Bellows-Sealed Valve (High-Temp) VCR Metal Gasket Seal Fitting	Valves	High Temp/ EP	SC-11	600°F 315°C
Swagelok® 1/4" Female Nut	Female Nut	Standard	SC-10	---
Swagelok® Stainless 1/4" VCR Silver Plated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Silver plated	N/A	---

Assembly components are not available for individual sale.

Standard Assembly



Swagelok® Cylinder, 50ml



Swagelok® 1/4" Female Nut



Swagelok® 1/4" Stainless 1/4" VCR Silver Plated Gasket Retainer Assembly

Valve Types



96-1070 Valve



96-1071 Valve

Swagelok® Cylinder Assemblies for ALD

Electropolished (EP) Assembly with Ball Valve or High-Temp Valve (Optional)

96-1075 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male Ball Valve (SC-11 cleaned) and Female Nut, electropolished for CVD/ALD

1/4" VCR Male Ball Valve (EP) rated to 300°F or 148°C



Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, Electropolished, 50ml	Cylinder Body	EP	SC-11	---
Swagelok® 1/4" Male Ball Valve, VCR Metal Gasket Face Seal Fitting, SC-11 cleaned	Valves	EP	SC-11	300°F 148°C
Swagelok® 1/4" Female Nut, SC-11 cleaned	Female Nut	EP	SC-11	---
Swagelok® Stainless 1/4" VCR Unplated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Unplated	N/A	---

96-1076 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male Bellows-Sealed Valve (High-Temp) and Female Nut, electropolished for CVD/ALD

1/4" VCR Male Bellows-Sealed Valve (High-Temp/EP) rated to 600°F or 315°C



Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, Electropolished, 50ml	Cylinder Body	EP	SC-11	---
Swagelok® 1/4" Male Bellows-Sealed Valve (High-Temp) VCR Metal Gasket Seal Fitting, SC-11 cleaned	Valves	High Temp/ EP	SC-11	600°F 315°C
Swagelok® 1/4" Female Nut, SC-11 cleaned	Female Nut	EP	SC-11	---
Swagelok® Stainless 1/4" VCR Unplated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Unplated	N/A	---

Assembly components are not available for individual sale.

Standard Assembly



Swagelok® Cylinder, Electropolished, 50ml



Swagelok® 1/4" Female Nut,
SC-11 cleaned



Swagelok® 1/4" Stainless 1/4"
VCR Unplated Gasket Retainer
Assembly

Valve Types



96-1075 Valve



96-1076 Valve

Swagelok® Cylinder Assemblies for ALD

DP Valve Assembly

96-1077 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male DP Valve (Ultra High Purity) and Female Nut, electropolished for CVD/ALD

1/4" VCR Male DP high pressure diaphragm Valve (Ultra High Purity/EP) rated to 50-320°F or 10-148°C



Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, Electropolished 50ml	Cylinder Body	EP	SC-11	---
Swagelok® 1/4" Male DP high pressure diaphragm Valve (Ultra High Purity), polyimide seat, VCR Metal Gasket Seal Fitting, SC-01 cleaned	Valves	Ultra High Purity/EP	SC-01	50° - 302°F 10° - 148°C
Swagelok® 1/4" Female Nut, SC-11 cleaned	Female Nut	EP	SC-11	---
Swagelok® Stainless 1/4" VCR Unplated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Unplated	N/A	---

96-1078 Swagelok® Cylinder Assembly, 50ml with 1/4" VCR Male DP High Pressure Valve (High Purity), PCTFE seat, VCR Metal Gasket Seal Fitting, Round Handle

1/4" VCR Male DP high pressure diaphragm Valve (High Purity/EP) rated to 250°F or 121°C



Item Description	Category	Type	Cleaning	Temperature Rating
Swagelok® Cylinder, Electropolished, 50ml	Cylinder Body	EP	SC-11	---
Swagelok® 1/4" Male DP high pressure diaphragm Valve (High Purity), PCTFE seat, VCR Metal Gasket Seal Fitting, Round handle, SC-11 cleaned	Valves	High Purity/EP	SC-11	250°F 121°C
Swagelok® 1/4" Female Nut, SC-11 cleaned	Female Nut	EP	SC-11	---
Swagelok® Stainless 1/4" VCR Unplated Gasket Retainer Assembly, 2 pcs	Gasket Assembly	Unplated	N/A	---

Assembly components are not available for individual sale.

Ultra High Purity & DP Valve Assembly



Swagelok® Cylinder, Electropolished, 50ml



Swagelok® 1/4" Female Nut,
SC-11 cleaned



Swagelok® 1/4" Stainless 1/4"
VCR Unplated Gasket Retainer
Assembly

Valve Types



96-1077 Valve

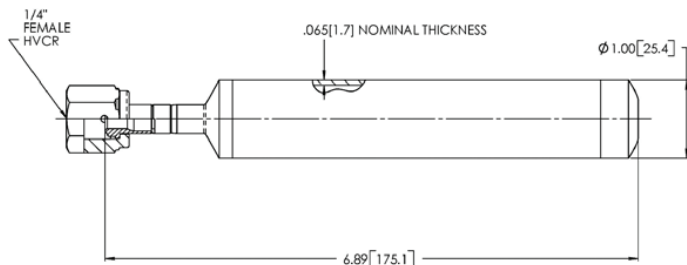


96-1078 Valve

Swagelok® Cylinder Assemblies for ALD

Definition of Swagelok® Cleaning Codes

SC-01	Ultra High Purity Process - DI water cleaning system is closed to the environment and limits contamination. A series of ultrasonic washing and multistage DI water rinse before drying.
SC-10	Standard Cleaning - Basic industrial procedures.
SC-11	Special Cleaning - Multistep process that ensures thorough cleaning, rinsing, draining and drying.



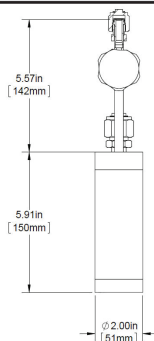
- Drawing is not to scale
- Dimensions are in inches [millimeters in brackets]
- Drawing subject to change without notice

Swagelok® Trademark is owned by Swagelok Company. Registered user in Canada: SWAGELOK Canada, Ltd.
SWAGELOK AG is an authorized user in Switzerland of the SWAGELOK trademark.

Additional Cylinders for ALD

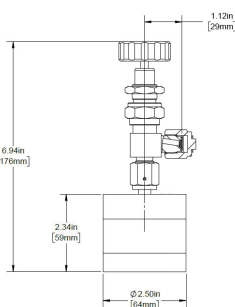
95-4154 Stainless steel cylinder, 200ml, single vertical stem, electropolished with fill-port, PCTFE valve stem tip, DOT 4B, UN stamped

Cylinder Size	2" Diameter
Cylinder Working Volume	200ml
Cylinder Total Volume	233ml
Cylinder Tare Weight	2.75
Design Pressure	300PSI
Test Pressure	600PSI
Design Temperature	250°F/121°C
Fillport	1/2" MCVR
Outlet Valve	SS-DSTW4
D.O.T. Specification	4B-300



95-0281 Stainless steel cylinder, 125ml, horizontal in line, with angled Bellows valve (150°C), DOT 4B, UN stamped

Cylinder Size	2.5" Diameter
Cylinder Working Volume	125ml
Cylinder Total Volume	137ml
Cylinder Tare Weight	1.89 lbs
Design Pressure	260PSI
Test Pressure	520PSI
Design Temperature	-10 to 150 C*
Inlet Valve	FUJIKIN, FUB-81-6.35-PI
D.O.T. Specification	4B-260

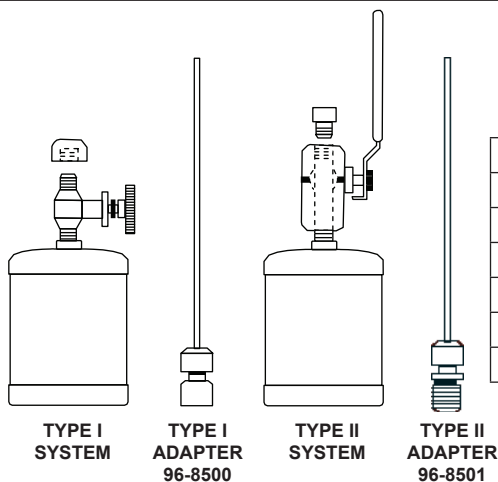


The FUB-81-6.35-PI valve is rated for 150°C but per the manufacturer, it can be heated to 175°C if the total number of cycles does not exceed 200 annually during usage

Cylinders and Adapters

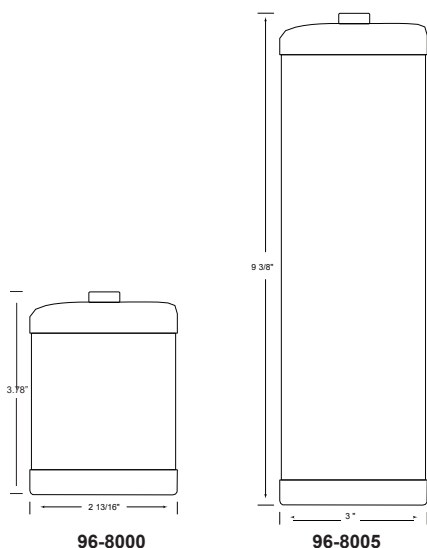
Caution!

Due to the hazardous nature of many of the materials packaged in metal cylinders, we strongly recommend that all users read the technical note associated with the catalog numbers below posted at strem.com carefully before using the product. The cylinders and valves are used primarily for the safe transport and storage of pyrophoric materials. As with any air-sensitive compound, the cylinder should be taken into an inert atmosphere bag or box to remove the product. If you are unsure of the handling procedures and need assistance, please contact the Operations & Logistics Manager at (978) 499-1600 (All countries) or (800) 647-8736 (USA & Canada only).



Cat #	Description
96-8500	Swagelok® Type I Adapter
96-8501	Swagelok® Type II Adapter
96-8105	Brass needle valve (Type I)
96-8100	Brass ball valve (Type II)
96-8000	Cylinder, carbon steel, 275 ml
96-8005	Cylinder, carbon steel, 900 ml

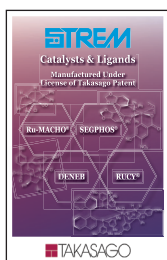
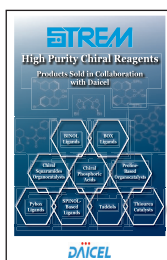
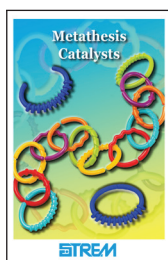
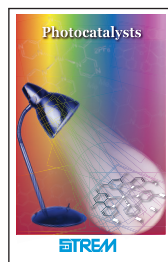
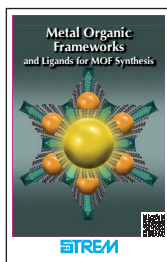
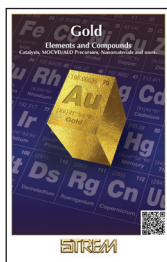
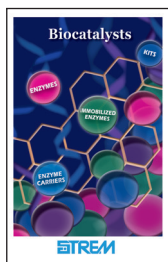
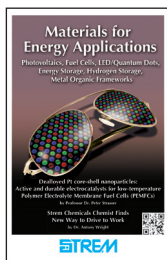
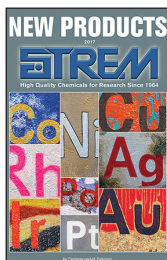
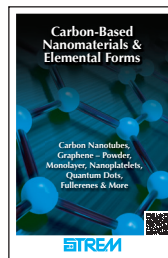
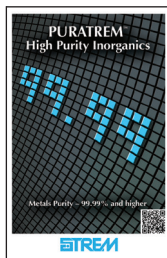
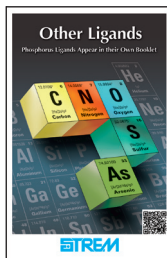
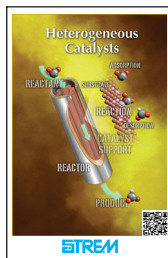
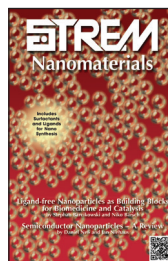
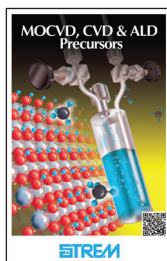
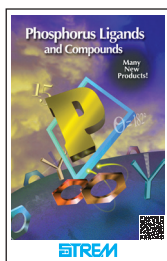
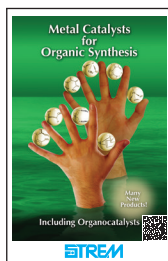
For instruction details on Type I or Type II systems please visit strem.com



96-8000	
Contents:	275 ml
Design Pressure:	240 psig
Outlet Fitting:	1/4 NPTF pipe thread size
Weight:	0.7 lbs
Dimensions:	2 13/16" dia x 3 7/8"
D.O.T. Specs:	DOT-4 B240

96-8005	
Contents:	900 ml
Design Pressure:	240 psig
Outlet Fitting:	1/4 NPTF pipe thread size
Weight:	1.5 lbs
Dimensions:	3" dia x 9 3/8"
D.O.T. Specs:	DOT-4 B240ET

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