

METALS • INORGANICS • ORGANOMETALLICS • CATALYSTS • LIGANDS • NANOMATERIALS • CUSTOM SYNTHESIS • cGMP FACILITIES

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| <p>20-8200</p> | <p>27-0468 & 27-0469</p> | <p>27-0485 & 27-0486</p> | <p>29-7100</p> |
| <p>64-3575</p> | <p>26-0145</p> | <p>57-1200</p> | <p>57-1500</p> |
| <p>03-8000</p> | <p>71-1050</p> | <p>12-0865</p> | <p>12-0845</p> |
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| <p>50-1170</p> | <p>70-1000</p> | <p>39-1550</p> | <p><i>These products are sold under, use subject to, terms and conditions of label license at www.strem.com/harvard2</i></p> |

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|--|--|-------|
| 20-8200 | Bis(N,N'-diisopropylformamidinato)calcium(II) dimer, (99.99 %-Ca) PURATREM (1959584-78-1) | 1g |
| | C ₂₈ H ₆₀ Ca ₂ N ₈ ; FW: 588.99; tan to light-brown pwdr. <i>air sensitive, moisture sensitive</i> | 5g |
| Technical Note: | | |
| 1. Calcium amidinate precursor for the atomic layer deposition (ALD) of calcium containing thin films. | | |
| References: | | |
| 1. <i>Angew. Chem. Int. Ed.</i> , 2016 , 55, 10228 –10233. | | |
| 27-0468 | Bis(N-t-butyl-N'-ethylpropanimidamido)cobalt(II), min. 98% (1011477-51-2) | 1g |
| | C ₁₈ H ₃₈ CoN ₄ ; FW: 369.45; blue-green liq. <i>air sensitive, moisture sensitive</i> | 5g |
| Technical Note: | | |
| 1. Volatile cobalt complex for the atomic layer deposition of cobalt metal. | | |
| References: | | |
| 1. <i>Chemistry of Materials</i> , 2014 , 26, 2642 | | |
| 2. <i>J. Phys. Chem. Lett.</i> , 2014 , 5, 1091 | | |
| 3. <i>Dalton T.</i> , 2008 , 19, 2592 | | |
| 27-0469 | Bis(N-t-butyl-N'-ethylpropanimidamido)cobalt(II), min. 98% (99.99%-Co) PURATREM (1011477-51-2) | 1g |
| | C ₁₈ H ₃₈ CoN ₄ ; FW: 369.45; blue-green liq. <i>air sensitive, moisture sensitive</i> | 5g |
| Technical Note: | | |
| 1. Volatile Cobalt precursor for ALD/CVD | | |
| References: | | |
| 1. <i>J. Phys. Chem. Lett.</i> , 2014 , 5, 1091 | | |
| 2. <i>Chem. Mater.</i> , 2014 , 26, 2642 | | |
| 3. <i>J. Mater. Chem. C.</i> , 2015 , 3, 2500 | | |
| 27-0485 | Bis(N,N'-di-i-propylacetamidinato)cobalt(II), min. 98% Co(iPr-MeAMD)₂ (635680-58-9) | 250mg |
| amp | C ₁₆ H ₃₄ CoN ₄ ; FW: 341.40; green xtl.; m.p. 84°; b.p. sublimes 50°C (50 mTorr) <i>air sensitive, moisture sensitive</i> | 1g |
| | | 5g |
| Technical Notes: | | |
| 1. Precursor with metal nitrogen bonds used for the atomic layer deposition of metals, nitrides, and oxides. See WO 2004/046417A2. | | |
| 2. Copper complex used in the vapor phase, atomic layer deposition of Co ₉ S ₈ and its application for super conductors. | | |
| 3. Complex used in the atomic layer deposition of cobalt sulfide. | | |
| References: | | |
| 1. <i>Nano Letters</i> , 2015 , 15, 6689 | | |
| 2. <i>ACS Nano</i> , 2015 , 9, 8484 | | |
| 27-0486 | Bis(N,N'-di-i-propylacetamidinato)cobalt(II), min. 98% (99.99%-Co) PURATREM (Co(iPr-MeAMD)₂ (635680-58-9) | 250mg |
| amp | C ₁₆ H ₃₄ CoN ₄ ; FW: 341.40; green xtl.; m.p. 84°; b.p. sublimes 50°C (50 mTorr) | 1g |
| HAZ | <i>air sensitive, moisture sensitive</i> | 5g |
| Technical Note: | | |
| 1. See 27-0485 (page 2) | | |
| 29-7100 | Bis(N,N'-di-sec-butylacetamidinato)dicropper(I), 99% (695188-31-9) | 250mg |
| amp | (C ₁₀ H ₂₁ N ₂) ₂ Cu ₂ ; FW: 465.67; white to off-white xtl. <i>air sensitive, moisture sensitive, (store cold)</i> | 1g |
| | | 5g |
| Technical Note: | | |
| 1. Precursor with metal nitrogen bonds used for the atomic layer deposition of metals, metal nitrides, and oxides. See WO 2004/046417A2. | | |
| References: | | |
| 1. <i>Chem. Mater.</i> , 2011 , 23, 4411 | | |
| 2. <i>J. Am. Chem. Soc.</i> , 2009 , 131, 18159 | | |
| 3. <i>Appl. Phys. Lett.</i> , 2009 , 94, 123107 | | |
| 4. <i>Inorg. Chem.</i> , 2005 , 44, 1728 | | |
| 64-3575 | Tris(N,N'-di-i-propylformamidinato)gadolinium(III), (99.999+%-Gd) PURATREM Gd-FMD | 1g |
| NEW | C ₂₁ H ₄₅ GdN ₆ ; FW: 538.87; white to off-white pwdr. <i>air sensitive, moisture sensitive</i> | 5g |

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| | | |
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| 26-0145 | Bis(N,N'-di-t-butylacetamidinato)iron (II), min. 98% (635680-56-7) | 250mg |
| amp | C ₂₀ H ₄₂ N ₄ Fe; FW: 394.42; dark gray solid; m.p. 107° <i>air sensitive, moisture sensitive</i> | 1g 5g |
| Note: Extremely air-sensitive. Contact Strem to discuss. | | |
| Technical Notes: | | |
| 1. Iron amidinate used in the chemical vapor deposition of iron, iron carbides and iron nitride films. | | |
| 2. Precursor for the MOCVD of iron-containing thin films. | | |
| 3. Fabrication of thin films of iron oxide via atomic layer deposition. | | |
| References: | | |
| 1. <i>Journal of the Electrochemical Society</i> , 2010 , 157, D454 | | |
| 2. <i>ECS Transactions</i> , 2009 , 25, 181 | | |
| 3. <i>ACS Appl. Mater. Interfaces</i> 2015 , 7, 16138 | | |
| 57-1200 | Tris(N,N'-di-i-propylformamidinato)lanthanum(III), (99.999+%-La) PURATREM La-FMD (1034537-36-4) | 1g |
| amp | C ₂₁ H ₄₅ LaN ₆ ; FW: 520.53; white to off-white powdr. | 5g |
| HAZ | <i>air sensitive, moisture sensitive</i> | |
| Technical Note: | | |
| 1. Lanthanum precursor for the ALD/CVD of La ₂ O ₃ , LaLuO ₃ , LaScO ₃ , and LaYO ₃ thin films. | | |
| References: | | |
| 1. <i>Appl. Phys. Lett.</i> , 2009 , 94, 262904 | | |
| 2. <i>Electrochem. Solid-State Lett.</i> , 2009 , 12, G13 | | |
| 3. <i>Appl. Phys. Lett.</i> , 2010 , 97, 162910 | | |
| 4. <i>J. Electrochem. Soc.</i> , 2011 , 158, H447 | | |
| 5. <i>ECS Trans.</i> , 2012 , 45, 95 | | |
| 6. <i>Nano Lett.</i> , 2013 , 13, 594 | | |
| 7. <i>J. Crystal Growth</i> , 2013 , 363, 150 | | |
| 8. <i>ECS Trans.</i> , 2013 , 54, 255 | | |
| 9. <i>App. Surface Sci.</i> , 2014 , 292, 880 | | |
| 10. <i>Proc. SPIE</i> , 2014 , 8987, 898712 | | |
| 57-1500 | Tris(N,N'-di-i-propylpentylamidinato)lanthanum(III), 98% (99.999%-La) PURATREM | 1g |
| amp | C ₃₃ H ₆₉ N ₆ La; FW: 688.84; off white to beige solid <i>air sensitive, moisture sensitive</i> | 5g |
| 03-8000 | (N,N'-Di-i-propylacetamidinato)lithium, min. 97% (99.99+%-Li) PURATREM | 1g |
| | C ₈ H ₁₇ N ₂ Li; FW: 148.17; off white to beige solid <i>air sensitive, moisture sensitive</i> | 5g |
| 71-1050 | Tris(N,N'-di-i-propylacetamidinato)lutetium(III), 99% | 250mg |
| amp | Lu(C ₈ H ₁₇ N ₂) ₃ ; FW: 598.67; white to off-white powdr. <i>air sensitive, moisture sensitive</i> | 1g 5g |
| 12-0865 | Bis(N-t-butyl-N'-ethylpropanimidamidato)magnesium, min. 98% (99.99+%-Li) PURATREM | 1g |
| amp | C ₁₈ H ₃₈ MgN ₄ ; FW: 334.82; off-white to tan solid <i>air sensitive, moisture sensitive</i> | 5g |
| 12-0845 | Bis(N,N'-di-sec-butylacetamidinato)magnesium, 99% | 1g |
| | C ₂₀ H ₄₂ MgN ₄ ; FW: 362.88; colorless to pale yellow liq. <i>moisture sensitive</i> | 5g |
| 25-0230 | Bis(N,N'-di-i-propylpentylamidinato)manganese(II), min. 98% (1188406-04-3) | 250mg |
| amp | C ₂₂ H ₄₆ MnN ₄ ; FW: 421.57; brown solid <i>air sensitive, moisture sensitive</i> | 1g 5g |
| References: | | |
| 1. <i>J. Phys. Chem. C</i> , 2012 , 116, 23585 | | |
| 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° <i>air sensitive, moisture sensitive</i> | 1g 5g |
| 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 H ₂ S. | | |
| References: | | |
| 1. <i>Chem. Mater.</i> , 2010 , 22, 3060 | | |
| 2. <i>Chem. Mater.</i> , 2016 , 28, 1155. | | |

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|----------------|---|----------|
| 44-0056 | Bis(N,N'-di-tert-butylacetamidinato)ruthenium(II) dicarbonyl, 98% (99.99%-Ru) PURATREM (949113-49-9) | 1g |
| amp | 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> | 5g |
| 21-1200 | Tris(N,N'-di-i-propylformamidinato)scandium(III), (99.9%-Sc) | 1g |
| | C ₂₁ H ₄₅ ScN ₆ ; FW: 426.58; white to off-white powdr. <i>air sensitive, moisture sensitive</i> | 5g |
| 50-1170 | Bis(N,N'-di-i-propylacetamidinato)tin(II), 99% (1421599-46-3) | 250mg |
| amp | Sn(C ₈ H ₁₇ N ₂) ₂ ; FW: 401.18; white xtls. <i>air sensitive, moisture sensitive</i> | 1g 5g |

References:

1. *Chem. Mater.*, **2014**, 26, 3065.
2. *Adv. Eng. Mater.*, **2011**, 1, 1116

| | | |
|----------------|---|----------|
| 70-1000 | Tris(N,N'-di-i-propylacetamidinato)ytterbium(III), 99% | 250mg |
| | Yb(C ₈ H ₁₇ N ₂) ₃ ; FW: 596.74; white to off-white powdr. <i>air sensitive, moisture sensitive</i> Note: ALD precursor. | 1g 5g |
| 39-1550 | Tris(N,N'-di-i-propylformamidinato)yttrium(III), 97% | 250mg |
| amp | C ₂₁ H ₄₅ N ₆ Y; FW: 470.53; light beige-yellow solid <i>air sensitive, moisture sensitive</i> | 1g 5g |

Additional Product Details

Metal amidinate complexes, with intriguing structural diversity and novel properties, have been the subject of intense investigations in chemistry, electronics, optics, energy, and materials science.^[1-4] Great interest has been focused on the applicability of the complexes as single-source precursors of advanced functional materials,^[5] Metal-based amidinate complexes have been used as volatile precursors for Atomic Layer Deposition of films with novel versatile properties. This allows a wide variety of applications in modern high technology, including semiconductor micro-electronics, high-resolution displays, optical filters, magnetic information storage, and catalysis.^[10-12] The precursors need to be designed in such a way that the compounds are volatile and thermally stable at growth temperatures.^[10,13] Generally, more volatility directly correlates with a better precursor. The synthesis and characterization of numerous metal compounds with amidinate ligands have been reported in the literature.^[10,12-14] The volatility and thermal stability of symmetric amidinates of transition metals and lanthanum with oxidation states of one (Cu, Ag, Au),^[15] two (Mg, Mn, Fe, Co, Ni),^[16] three (Ti, V, Y, Al, Ga, La),^[17] and four (Ru, Hf)^[8] have been reported.

References

1. A. R. Sadique, M. J. Heeg, C. H. Winter, *J. Am. Chem. Soc.* **2003**, 125, 7774-7775.
2. J. R. Hagadorn, J. Arnold, *Angew. Chem. Int. Ed.* **1998**, 37,1729-1731; *Angew. Chem.* **1998**, 110, 1813-1815.
3. H. Kondo, K. Matsubara, H. Nagashima, *J. Am. Chem. Soc.* **2002**, 124, 534-535.
4. X. Jiang, J. C. Bollinger, M. H. Baik, D. Lee, *Chem. Commun.* **2005**, 8, 1043-1045.
5. J. Barker, N. C. Blacker, P. R. Phillips, N. W. Alcock, W. Errington, M. G. H. Wallbridge, *J. Chem. Soc., Dalton Trans.* **1996**, 431-437.
6. D. Abeysekera, K. N. Robertson, T. S. Cameron, J. A. C. Clyburne, *Organometallics* **2001**, 20, 5532-5536.
7. C. Villiers, P. Thuery, M. Ephritikhine, *Eur. J. Inorg. Chem.* **2004**, 23, 4624-4632.
8. D. A. Kissounko, Y. H. Zhang, M. B. Harney, L. R. Sita, *Adv. Synth. Catal.* **2005**, 347, 426-432.
9. T. Chivers, C. Fedorchuk, M. Parvez, *Organometallics* **2005**, 24, 580-586.
10. B. S. Lim, A. Rahtu, J.-S. Park, R. G. Gordon, *Inorg. Chem.* **2003**, 42, 7951-7958.
11. a) D. Hausmann, J. Becker, S. Wang, R. G. Gordon, *Science* **2002**, 298, 402-406
b) B. S. Lim, A. Rahtu, R. G. Gordon, *Nat. Mater.* **2003**, 2, 749-754
c) R. G. Gordon, S. Barry, R. N. R. Broomhall-Dillard, D. J. Teff, *Adv. Mater. Optics Electron.* **2000**, 10, 201-211.
12. A. I. Kingon, J. P. Maria, S. K. Streiffer, *Nature* **2000**, 406, 1032-1038.
13. Z. Li, S. T. Barry, R. G. Gordon, *Inorg. Chem.* **2005**, 44, 1728-1735.
14. F. T. Edelmann, D. M. M. Freckmann, H. Schumann, *Chem. Rev.* **2002**, 102, 1851-1896.
15. H. E. Abdou, A. A. Mohamed, J. M. Lopez-de-Luzuriaga, J. P. Fackler, *J. Cluster Sci.* **2004**, 15, 397-411.
16. a) R. T. Boere, M. L. Cole, P. C. Junk, *New J. Chem.* **2005**, 29, 128-134;
b) F. A. Cotton, N. S. Dalal, C. Y. Liu, C. A. Murillo, J. M. North, X. P. Wang, *J. Am. Chem. Soc.* **2003**, 125, 12945-12952.
c) M. J. McNevin, J. R. Hagadorn, *Inorg. Chem.* **2004**, 43, 8547-8554
d) P. de Rouffignac, J. S. Park, R. G. Gordon, *Chem. Mater.* **2005**, 17, 4808-4814
e) W. X. Zhang, M. Nishiura, Z. M. Hou, *J. Am. Chem. Soc.* **2005**, 127, 16788-16789
f) M. L. Cole, C. Jones, P. C. Junk, M. Kloth, A. Stasch, *Chem. Eur. J.* **2005**, 11, 4482-4491.

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