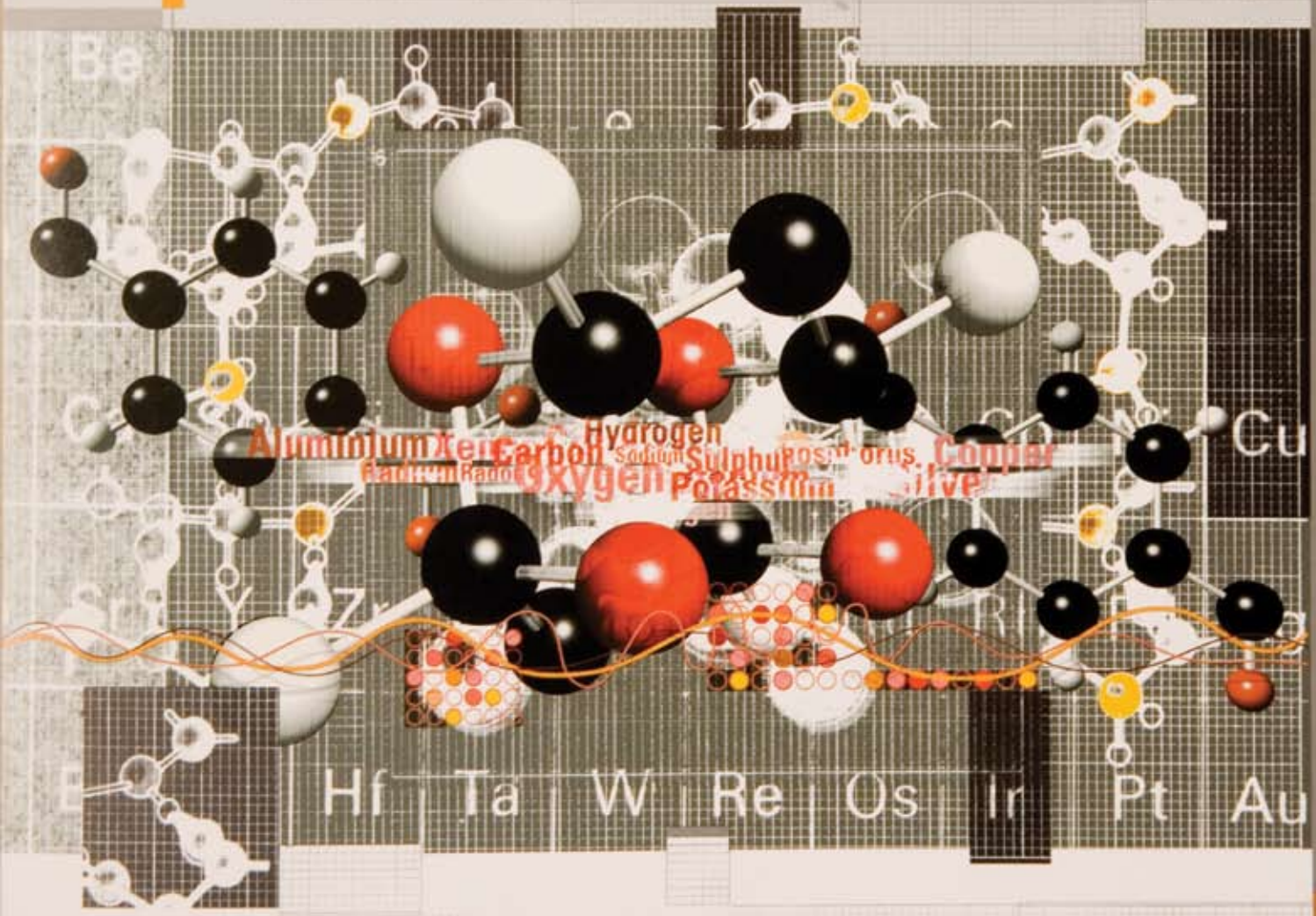
Gelest

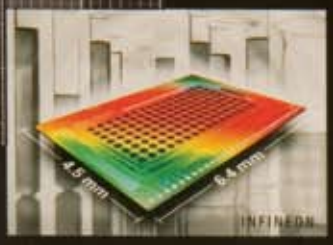
ENABLING YOUR TECHNOLOGY

Gelest develops molecular materials that enable nanotechnology through surface modification for industrial applications in:

Microelectronics & Optoelectronics

Displays, Optics & Telecommunications
Energy & Transportation
Biotechnology & Health Sciences
Consumer Goods & Personal Care





Nanotechnology encompasses processes that have control of physical and chemical features at the molecular level.

Gelest produces Group IV molecular materials for scientists and engineers who develop innovative technology; who need to go beyond the current selection of materials, who push the envelope. Gelest's technical staff actively works with these scientists and engineers to develop new molecular materials. Gelest has built a state-of-the-art facility equipped with synthetic labs, development labs, commercial manufacturing facilities along with support services such as analytical testing and a global distribution network to supply the biotechnology, health sciences, displays, optics, telecommunications, microelectronics, optoelectronics, chemical and plastics, and personal care industries.

Gelest leverages its expertise in Group IV chemistry and process technology to develop these innovative molecular materials for surface modification. These are hybrid materials containing both organic and inorganic reactivity in the same molecule and can react with metal oxide, plastic and gold substrates to form very stable covalent bonds. These molecules can be customized to control reactivity and selectivity. Chemistry is the key that allows the surface modification to enhance electrical, mechanical, and thermal properties and provide protection from environmental elements. Group IV molecular materials are typically applied as coatings to impart the following properties:

Anti-stiction Lubrication **Adhesion** **Reactivity**
Anti-reflection Biocompatibility Organocompatibility Hydrophobicity
Hydrophilicity **Dielectric** Drug Delivery **Bioactive**
Gas Permeability Protective Catalytic Optical & Conductive
Moisture Resistance Anti-fouling **Scratch Resistance**

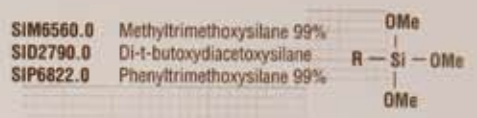
LITHOGRAPHY

Microcontact Printing or Soft Lithography

Gelest offers PDMS, polydimethylsiloxane elastomers, and a complete line of reactive silicones, catalysts, adhesion promoters and additives to modify the surface and mechanical properties of PDMS rubber stamps. In addition, scientists and engineers that need to formulate PDMS rubber in order to customize surface and mechanical properties can obtain the necessary components from the "Gelest Reactive Silicones" brochure. Gelest offers an extensive range of formulated PDMS rubber in the "Gelest Silicones Encapsulating and Coatings" brochure. Typical formulated PDMS products are:

Gelest RG™ 02	2-part reprographic silicone rubber
Gelest OE™ 41.2 Accelerated cure	2-part silicone rubber
Gelest OE™ 41.6 Low volatility	2-part silicone rubber

SIM6560.0 Methyltrimethoxysilane 99%
SID2790.0 Di-t-butoxydiacetoxysilane
SIP6822.0 Phenyltrimethoxysilane 99%



SAMs: Self-Assembled Monolayers

Gelest has developed a line of Group IV molecular materials that can be applied from solution or neat with conventional lithography techniques to form SAMs. SAMs is a surface modification technique by which a single layer of molecules chemically bond to a metal oxide, gold or plastic substrate. The surface can be selectively modified to achieve the desired mechanical as well as chemical and biological properties for MEMS and BioMEMS, µarrays and µfluidics devices. Some developing applications for SAMs are dip-pen nanolithography and molecular electronics.

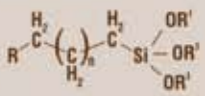
DPN -Dip-Pen Nanolithography DPN is a surface modification technique that uses an AFM to apply molecules that form SAMs on metal oxide and gold surfaces.

MEMS

Group IV molecular materials ability to form permanent covalent bonds with metal oxide and gold surfaces makes them ideal for MEMS and BioMEMS devices. Surface modification and packaging are necessary steps in the manufacturing of MEMS devices because surfaces are highly susceptible to stiction, moisture and environmental elements such as ozone. These materials provide MEMS devices with anti-stiction, lubrication, anti-fouling and moisture resistance (MRTs) properties. In addition, surface modification allows for the attachment of reactive and bioactive molecules, oligonucleotides, proteins and DNA to make BioMEMS devices.

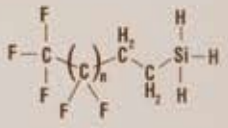
Metal Oxides

SIA0591.0 N-(2-Aminoethyl)-3-aminopropyltrimethoxysilane DAMO (R=Diamine)
SIA0200.0 Acryloxypropyltrimethoxysilane (R=Acrylate)
SIA0540.0 Allyltrimethoxysilane (R=Vinyl)
SIA0611.0 Aminopropyltrimethoxysilane APS (R=Amine)
SIB0991.5 Norbornenyltrimethoxysilane (R=Norbornenyl)
SIE4670.0 Epoxycyclohexyltrimethoxysilane ECPS (R=Epoxy)
SIH5841.0 Perfluorodecyltrichlorosilane TSCA (Super-Hydrophobic)
SII6455.0 Isocyanatopropyltriethoxsilane CYNPS (R=Isocyanate)
SIM6476.0 Mercaptopropyltrimethoxysilane (R=Sulfide)
SIO6709.0 7-Octenyltrimethoxysilane OTS (R=Vinyl)
SIT8175.0 Perfluorooctyltriethoxysilane TSA (Super-Hydrophobic)
SIT8185.3 Triethoxysilybutyraldehyde ALDPS (R=Aldehyde)
SIM6492.7 Methoxy(polyethyleneoxy)propyltrimethoxysilane (Hydrophilic)

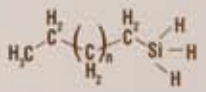


Gold Surfaces

SIT8173.0 Perfluorooctylsilane
SIH5840.8 Perfluorodecylsilane

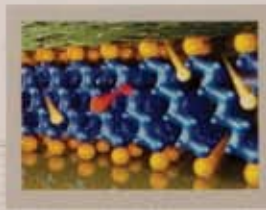


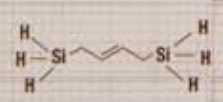
SIO6712.5 Octylsilane (C-8)
SID4629.6 n-Dodecylsilane (C-12)
SIO6635.0 Octadecylsilane (C-18)



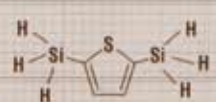
Molecular Electronics

Gelest's extensive expertise in Group IV chemical process technology allows for the development of molecular materials that can be useful in applications for molecular electronics. Gelest offers an extensive range of molecular materials for surface modification. For a complete product listing, please see the "Coupling Agents" brochure.

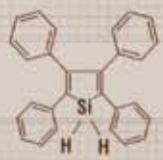




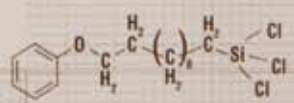
DISILYLBUTENE



DISILYLTHIOPHENE



TETRAPHENYLSILOLE



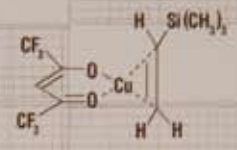
SIP6723.4
PHENOXYUNDECYLTRICHLOROSILANE
Orients and immobilizes pentacene

METALLIZATION

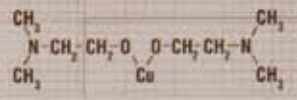
Gelest offers molecular materials for metallization applications in the semiconductor industry. Molecular materials derived from the Group III & IV elements (silicon, aluminum, titanium, tantalum, tungsten, indium, antimony and germanium) are used to create conductive coatings on silicon, germanium, silicon carbide, sapphire and plastic substrates. They can be gases, liquids or solids and are typically applied through various vapor deposition techniques such as CVD, MOCVD, PECVD and ALD. Gelest provides a complete line of packaging services that meet typical delivery system requirements.

Metallization

AKC252.8 Copper I hexafluoropentanedionate - vinyltrimethylsilane complex- Copper II hexafluoropentanedionate

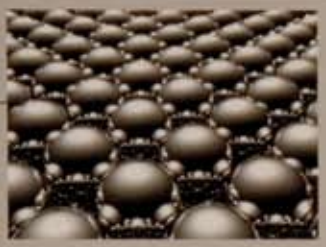


AKC248 Copper II Dimethylaminoethoxide



AKT890 Tungsten V ethoxide $W(OEt)_5$

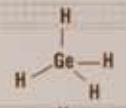
OMAL008.0 Alane-Trimethylamine complex $AlH_3{\cdot}(CH_3)_3N$



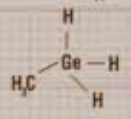
Please see the "Metal-Organics for Materials" and "Silicon Compounds" Catalogs.

Silicon Precursors

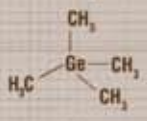
GEG5001 Germane 99%+



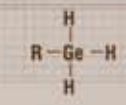
GEM6499 Methylgermane 99%+



GET7550 Tetramethylgermane 99%+



GEM6499 Methylgermane (R=Me)
GEE4695 Ethylgermane (R=Et)
GEB1969.5 n-Butylgermane (R=n-Bu)
GEB1970 t-Butylgermane 99%+ (R= t-Bu)



GEG5480 Germanium Telluride $GeTe$
GEG5350 Germanium Diselenide $GeSe_2$

Strained Silicon

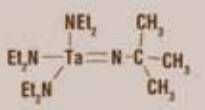
Germane is a Group IV molecular material that is used to form strained silicon. Gelest has developed "chloride-free" process technology to produce commercially high purity Germane, 1MS, 2MS and 3MS that meets industry standards for the semiconductor industry. In addition to high purity Germane, Gelest offers customized gas mixtures of Germane and silanes where optimal mixture ratios further improve the electron transport properties.

Barrier Layers

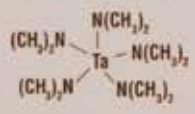
Group IV molecular materials are typically deposited via MOCVD techniques as well as ALD to improve adhesion of dielectric materials and to prevent diffusion of aluminum and copper.

Tantalum

OMTA082 Tris(diethylamino)(t-butylimino) tantalum, TBTDET



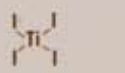
OMTA075 Tantalum Pentakis(dimethylamide)



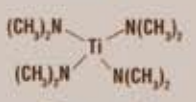
INTA070 Tantalum V Bromide $TaBr_5$

Titanium

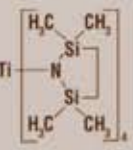
INTI070 Titanium tetraiodide



OMTI088 Titanium tetrakis(dimethylamide)



SIT8008.0 Titanium Tetrakis(tetramethyl)disilapyrrole



OMT1080 Titanium Tetrakis(dimethylamide)99%+, TDMAT (R=Me)
OMT1083 Titanium Tetrakis(ethylmethylamide)99%+, TEMAT (R=Et,Me)

Metal Silicate Precursors

Metal silicon nitride and metal silicon oxide ternary precursors, particularly tantalum, zirconium and hafnium, form highly refractory materials which are stable to extremely high temperatures and which are known to be nonreactive with copper.

Metal Silicates

Ce	SIC2264.6	Cerium III Tris(Hexamethyldisilazide)
Er	SIE4885.0	Erbium Tris(Hexamethyldisilazide)
Eu	SIE4907.0	Europium III Tris(Hexamethyldisilazide)
Ga	SIG4998.0	Gallium Tris[Bis(Trimethylsilyl)Amide]
Ge	GEB1026	Bis[Bis(Trimethylsilyl)methyl]Germanium II
Hf	OMHF066	Hafnium Bis(Hexamethyldisilazide)Dichloride
La	SIL6464.0	Lanthanum Tris(Hexamethyldisilazide)
Pr	SIP6902.1	Praseodymium Tris(Hexamethyldisilazide)
Sm	SIS6940.0	Samarium Tris(Hexamethyldisilazide)
Sn	SNB1025	Tin II Bis(Hexamethyldisilazide)
Tb	SIT6997.0	Terbium Tris(Hexamethyldisilazide)
Te	SIB1873.0	Bis(Trimethylsilyl)Telluride
Ti	SIT8008.0	Titanium Tetrakis(2,2,5,5-tetramethyl-2,5-disilapyrrole)
Y	SIY9680.0	Yttrium III Tris(Hexamethyldisilazide)
Zn	SIZ9700.0	Zinc Bis(Hexamethyldisilazide)
Zr	SIZ9310.0	Zirconium Bis(Hexamethyldisilazide)Dichloride
Zr	SIZ9900.0	Zirconium Tetrakis(2,2,5,5-tetramethyl-2,5-disilapyrrole)

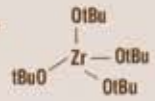
DIELECTRICS

Gate Dielectrics

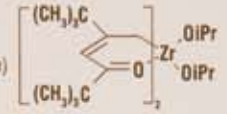
Gelest has developed patented "chloride-free" chemical process technology to commercially produce Group IV molecular materials for use as gate dielectrics and ILD (inter-layer dielectrics). Typical Group IV materials for gate dielectrics are compounds of hafnium, zirconium and rare earths such as cerium, lanthanum and praseodymium. Typical ILD precursors are silicon based. In addition, silicon-based molecular materials will play a critical role in future generation of porous dielectric materials that will require improved adhesion, mechanical and thermal properties. Porous ULK dielectrics will require the use of CAPS

Zirconium

AKZ946 Zirconium t-butoxide



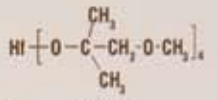
AKZ948 Zirconium Diisopropoxide Bis-(tetramethylheptanedionate)



OMZR080 (R=Me)(R=Et)
OMZR083 (R=Et, Me)

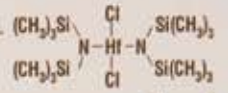
Hafnium

AKH333 Hafnium 2-Methoxymethyl-2-propoxide



AKH326 Hafnium t-butoxide

OMHF066 Hafnium Bis-(hexamethyldisilazide)-dichloride

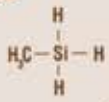


OMHF075 Hafnium Diethylamide (R=Et)
OMHF080 Hafnium Dimethylamide (R=Me)
OMHF083 Hafnium Tetrakis-(ethylmethylamide) (R=Et,Me)

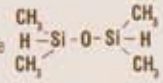
Inter-Layer Dielectrics

Thin Films

SIM6515.0 Methylsilane, 1MS
SIT8570.0 Trimethylsilane, 3MS

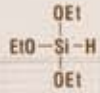


SIT7542.0 Tetramethyldisiloxane



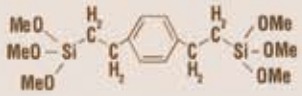
SIM6506.0
Methyldiethoxysilane

SIT8185.0
Triethoxysilane



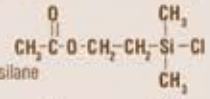
Porous Films -ULK

SIB1831.0
Bis(trimethoxysilyl)-ethylbenzene

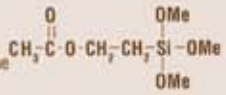


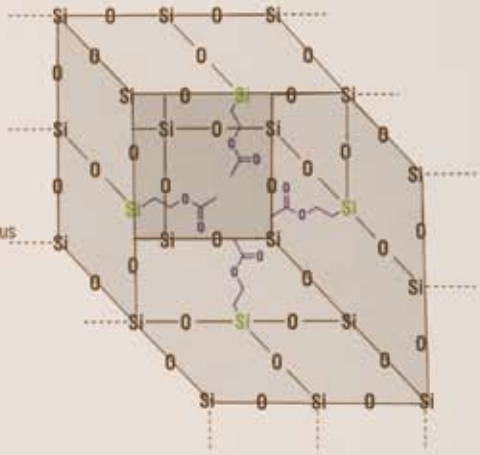
Seramic SI-A
8-acetoxyethylsilsesquioxane - Solution in methoxypropanol, Porous silicon dioxide precursor

SIA0010.0
Acetoxyethyldimethylchlorosilane



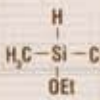
SIA0030.0
Acetoxyethyltrimethoxysilane



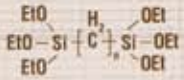


CAPS for Pore Sealing

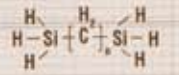
SID4125.0
Dimethylethoxysilane



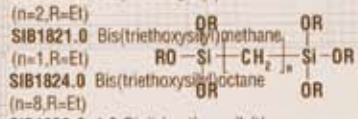
SIB1821.0 Bis(triethoxysilyl)methane
SIB1817.0 Bis(triethoxysilyl)ethane



SID4595.0 Disilapropane
SID4593.0 Disilabutane



SIB1817.0 Bis(triethoxysilyl)ethane (n=2,R=Et)
SIB1821.0 Bis(triethoxysilyl)methane, (n=1,R=Et)
SIB1824.0 Bis(triethoxysilyl)octane (n=8,R=Et)
SIB1832.0 1,6-Bis(trimethoxysilyl)hexane (n=6,R=Et)



Etch-Stop/ Barrier Layer

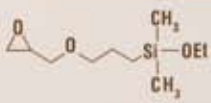
SIT7555.0 4MS-Tetramethylsilane
SIT8570.0 3MS-Trimethylsilane

ENCAPSULANTS & DIE ATTACH ADHESIVES

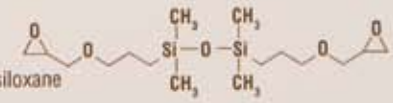
Gelest offers an extensive range of silanes, coupling agents, and silicones used in the formulation of die attach adhesives and encapsulants. For a complete product listing, please see the "Silane Coupling Agents", "Reactive Silicones" and "Silicone Coatings & Encapsulant Gels" brochures.

Die Attach Adhesives

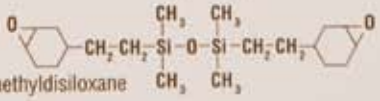
SIG5825.0
(3-Glycidoxypropyl)dimethylethoxysilane



SIB1115.0
1,3-Bis(Glycidoxypropyl)tetramethyldisiloxane



SIB1092.0
Bis[2-(3,4-Epoxycyclohexyl)ethyl]-tetramethyldisiloxane



optoelectronics

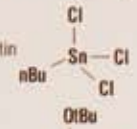
OLEDs

Group IV molecular materials are used to modify many types of surfaces, including glass, metal oxides and plastics. Plastic substrates play a critical role in the manufacture of flexible electronics for display applications. Group IV molecular materials can be used for metallization, by using low temperature vapor deposition techniques such as CVD and ALD, to yield conductive coatings, dielectric coatings and for light emitting diodes. In addition, the ability to customize the refractive index of Group IV molecular materials makes them ideal candidates for cladding fiber optic cables and planar wave-guides.

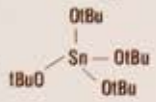
Gelest offers an extensive range of molecular materials for antireflection coatings, refractive index control coatings for planar waveguides and cladding. For a complete product listing, please see the "Metal-Organics for Materials" and "Silicon Compounds" catalogs.

Optically Conductive Coatings

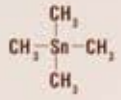
SNB2000
n-Butyltrichlorotin



SNT7064
Tin t-butoxide

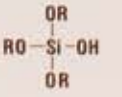


SNT7560
Tetramethyltin

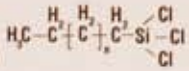


Dielectric Coatings

SIT8088.0 (R=t-Butyl)
Tri-t-butoxysilanol
SIT8627.0 (R=t-Pentyl)
Tri-t-butoxysilanol



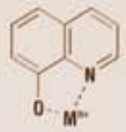
SIO6640.0
Octadecyltrichlorosilane (n=15)



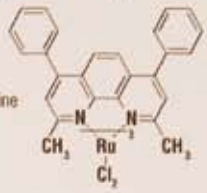
SIB0992.0
5-(Bicycloheptenyl) triethoxysilane

Triplet Emitters for OLEDs

AKA067 Aluminum 8-hydroxyquinolinate
AKZ933.8 Zinc 8-hydroxyquinolinate
AKA036 Aluminum 5-chloro-8-hydroxy-quinolinate

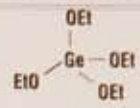


OMRU018
Bathophenanthroline ruthenium dichloride

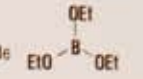


Optical Dopants

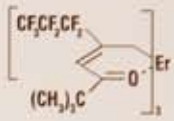
GET7100
Germanium tetraethoxide



AKB156.2
Boron ethoxide



AKE274
Erbium III FOD



Gelest is a worldwide supplier of commercial molecular materials for high tech industries and meets industry quality standards. We operate state-of-the-art characterization, synthesis, development and production facilities for chemicals and polymers.

Gelest

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