

## OXIDES

Oxides applications include Protection of aluminum mirrors, High temperature dielectric, Dielectric interference filter for ultra-violet radiation; use with cryolite, Thin-film capacitor, Beam splitter. multilayer; anti-reflection coating, Phosphorescent coating, Dielectric film, Transparent conductive films in electro-optical displays of the liquid crystal, Bubble memory devices and others

OXIDES						
MATERIAL	FORMULA	STANDARD PURITIES,	THEORETICAL DENSITY, g/cm <sup>3</sup>	LISTED MELTING POINT, °C	FABRICATION METHOD	SUGGESTED APPLICATIONS
<b>Aluminum oxide</b>	Al <sub>2</sub> O <sub>3</sub>	99.99	3.99	2045	Hot-pressed	Protection of aluminum mirrors. High temperature dielectric
<b>Antimony oxide</b>	Sb <sub>2</sub> O <sub>3</sub>	99.9	5.20	655	Hot-pressed	Dielectric interference filter for ultra-violet radiation; use with cryolite.
<b>Barium titanate</b>	BaTiO <sub>3</sub>	99.6 -99.9	6.06	1612	Hot-pressed	Thin-film capacitor
<b>Bismuth oxide</b>	Bi <sub>2</sub> O <sub>3</sub>	99.9	8.9	820	Hot-pressed	Beam splitter.
<b>Bismuth titanate</b>	Bi <sub>2</sub> Ti <sub>4</sub> O <sub>11</sub>	99.9	calc. 6.09	ca. 900	Hot-pressed	Beam splitter. Base coating for gold films for heating elements on glass.
<b>Bismuth titanate</b>	Bi <sub>4</sub> Ti <sub>7</sub> O <sub>12</sub>	99.9	8.11	ca. 900	Hot-pressed	Beam splitter. Base coating for gold films for heating elements on glass.
<b>Cerium oxide</b>	CeO <sub>2</sub>	99.9	7.30	1950	Hot-pressed	High index film; multilayer; anti-reflection coating
<b>Chromium oxide</b>	Cr <sub>2</sub> O <sub>3</sub>	99.8	5.21	0 >200	Hot-pressed	Absorbent brown film with medium

						index.
<b>Europium doped yttrium vanadate</b>	YV03-xEu2O3	99.9	varies	varies	Hot-pressed	Phosphorescent coating on special currency papers.
<b>Gallium oxide</b>	Ga2O3	99.999	5.88	1900	Hot-pressed	Dielectric film.
<b>Germanium oxide</b>	GeO2	99.999	4.23	1115	Hot-pressed	Dielectric film.
	(hexagonal)					
<b>Hafnium oxide (unstabilized)</b>	HfO2	99.95	9.68	2790	Hot-pressed	Dielectric coating. Very hard, adherent film.
<b>Hafnium oxide (stabilized)</b>	HfO2 - 10-15 wt. CaO	99	varies	varies	Hot-pressed	
<b>Hafnium oxide (stabilized)</b>	HfO2 - 10-15 wt. Y2O3	99	varies	varies	Hot-pressed	
<b>Indium oxide</b>	In2O3	99.99	7.18	2000	Hot-pressed	
		99.999			Hot-pressed	
<b>Indium oxide - tin oxide</b>	xIn2O3 - ySnO2	99.99-99.999	varies	varies	Hot-pressed	Transparent conductive films in electro-optical displays of the liquid crystal, electro-luminescent and gas discharge types.
<b>tin oxide</b>	ySnO?	99.999				
<b>Iron oxide</b>	Fe2O3	99.9 -99.99	5.25		Hot-pressed	Beam splitter and interference layers. Magnetic films
<b>Iron oxide</b>	Fe3O4	99.5	5.18	1594	Hot-pressed	Beam splitter and interference

						layers. Magnetic films
<b>Lanthanum oxide</b>	La <sub>2</sub> O <sub>3</sub>	99.99 (very moisture sensitive)	6.6	2250	Hot-pressed	Thin film capacitors. Possible uses in PLZT devices
<b>Lead titanate</b>	PbTiO <sub>3</sub>	99.9	7.52	-	Hot-pressed	Thin-film capacitor
<b>Lead zirconate</b>	PbZrO <sub>3</sub>	99.7	7.81	-	Hot-pressed	Thin-film capacitor
<b>Lithium niobate</b>	LiNbO <sub>3</sub>	99.9	4.64	1253	Hot-pressed	Piezoelectrics
<b>Lutetium iron oxide (garnet)</b>	Lu <sub>3</sub> Fe <sub>5</sub> O <sub>12</sub>	99.9	7.15	-	Hot-pressed	Bubble memory devices
<b>Magnesium oxide</b>	MgO	99.5-99.99	3.58	2802	Hot-pressed	High temperature dielectric.
<b>Molybdenum oxide</b>	MoO <sub>3</sub>	99.99	4.69	795	Hot-pressed	Luminescent coatings.
<b>Niobium oxide</b>	Nb <sub>2</sub> O <sub>5</sub>	99.95	4.47	1460	Hot-pressed	Dielectric coating. Multilayers.
<b>Rare earth garnets</b>	Ln <sub>3</sub> M <sub>5</sub> O <sub>12</sub>	99.9	varies	varies	Hot-pressed	Bubble memory devices
<b>Rare earth oxides</b>	varies	99.9-99.99-99.999	varies	varies	Hot-pressed	Possible dielectric coatings
<b>Silicon dioxide</b>	SiO <sub>2</sub>	99.97-99.995	2.21	1713	Hot-pressed	Hard durable film with low index. Insulating layer
<b>Silicon monoxide</b>	SiO	99.9-99.99	2.13	1700(?)	Hot-pressed	Protective film for front surface aluminized mirrors Low index layer for infrared filters.

<b>Strontium titanate</b>	SrTiO <sub>3</sub>	99.9	4.15	2040	Hot-pressed	Thin film capacitors.
<b>Strontium zirconate</b>	SrZrO <sub>3</sub>	99	5.48	-	Hot-pressed	Thin film capacitors
<b>Tantalum oxide</b>	Ta <sub>2</sub> O <sub>5</sub>	99.95	7.53	1880	Hot-pressed	Dielectric film. Multilayers
<b>Thorium oxide</b>	ThO <sub>2</sub>	99.99	9.86	2100	Hot-pressed	RADIOACTIVE . Highly durable beam splitter
<b>Tin oxide</b>	SnO <sub>2</sub>	99.9	6.85	>1930	Hot-pressed	
<b>Titanium oxide</b>	TiO <sub>2</sub>	99.9-99.995	4.24	1855	Hot-pressed	High index film, multilayer interference filters
<b>Tungsten oxide</b>	WO <sub>3</sub>	99.99	7.16	1473	Hot-pressed	Shadow casting for electron microscopy
<b>Yttrium oxide</b>	Y <sub>2</sub> O <sub>3</sub>	99.9, 99.99, 99.999	4.84	2400	Hot-pressed	Hard film. Dielectric coating. Thin film capacitor.
<b>Zinc oxide</b>	ZnO	99.9-99.999	5.66	1975	Hot-pressed	Dielectric, in varistors, in gas sensors.
<b>Zirconium oxide unstabilized</b>	ZrO <sub>2</sub>	99.7	5.56	2687	Hot-pressed	Multilayers. Dielectric coating. Adherent coating with high refractive index
<b>Zirconium oxide stabilized</b>	ZrO <sub>2</sub> - 5-15 wt. CaO	99	varies	varies	Hot-pressed	Multilayers. Dielectric coating. Adherent coating with high refractive index
<b>Zirconium oxide stabilized</b>	ZrO <sub>2</sub> - 10-15 wt. Y <sub>2</sub> O <sub>3</sub>	99	varies	varies	Hot-pressed	Multilayers. Dielectric coating. Adherent

						coating with high refractive index