Evaporation Materials

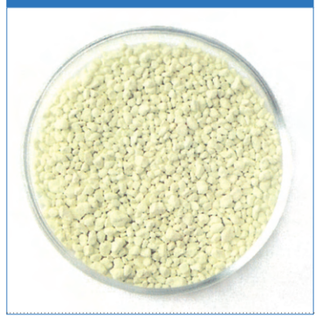
4M Electro-Optics Co.,Ltd

Contents

Metal and alloy thin-film materials

Formula	Melting Pointa℃	Evaporation Source	Refractive Index at 550nm	Transparency Range	Application
AL	660	B			Cold light coating HR coating
Ag	961	EB			HR coating
Au	1064	B			HR coating I Conductive coating
Cu	1085	EB			HR coating I Protected coating
Rh	1966	EB			HR coating

Low refractive index



Evaporation material	Chemical Formula	Refractive Index at 550nm	Transparency Range	Shape			Melting Pointa℃	Purity	Typical Application	Recommended Evaporation Source	Risk andSafety Indication
				Granules	Tablets	Crystal granules					
Calcium fluoride	CaF_2	1.23-1.46	0.15-12μm		•	•	1360	99.90% 99.999%	AR coating	B(W, Ta, Mo)	CAS No.7789-75-5
Natrium fluoride	NaF	1.29-1.30	0.2-14μm		•	•	992	99.90%	Infrared coating	B(Mo)	CAS No. 7681-49-4
Chromic fluoride+ Calcium fluoride	CrF_3+CaF_2	1.3-1.4		•	•			99.90%	Applied to infrared wavelength to form homogeneous dense film	B(W, Ta, Mo)	CAS No.7788-97-8/7789-75-5
Cryolite	Na_3AlF_6	1.32-1.35	0.2-1.4μm	•	•		1000	99.90%	Wide transparency range, excellent performance in infrared wavelength, usually applied to Infrared coating	B(Mo, Ta)	CAS No.15096-52-3 I R48/23/25,R20/22,R51/53,S45,S60,S61
Potassium fluoride	KF	1.35		•	•		880	99.95%	Filter and UV coating		CAS No.7789-23-3
Magnesium fluoride	MgF_2	1.38	0.11-10μm			•	1266	99.99%	Far Infrared coating	B(W, Ta, Mo)	CAS No.7783-40-6 I R20/21/22,R36/37/38,R64,S22,S26,S28,S36/37
Aluminium fluoride	AlF_3	1.38	0.2-20μm	•			900	99.90%	Multilayer coating I AR coating Decorative coating Glasses coating I UV coating	B	CAS No.7784-18-1
Silicon dioxide	SiO_2	1.45-1.46	0.2-9μm	•	•	•	1700	99.99%	UV coating	E	CAS No.7631-86-9
Strontium fluoride	SrF_3	1.45	0.2-10μm	•	•		1190	99.90%	AR coating I Cold light coating Filter I Insulating coating Glasses coating I UV coating	B(W, Mo)	
Barium fluoride	BaF_2	1.47	0.25-15μm	•	•		1280	99.90%	Infrared coating	B	CAS No. 7787-32-8 I R20/21/22,R36/37 /38,S22,S26,S28,S36/37
Silicon dioxide+ Aluminium oxide	SiO_2+Al_2O_3	1.48	0.3-7μm	•	•		2000	99.99%	Infrared coating	E	CAS No. 7631-86-9/1344-28-1
Ytterbium fluoride	YbF_3	1.52	0.22-12μm	•			1157	99.99%	AR coating Glasses coating	E	CAS No.13760-80-0
Erbium fluoride	ErF_3			•			1350	99.99%	Wide transparency range, excellent performance in infrared wavelength, usually applied to Infrared coating		CAS No.13760-83-3

B: Resistance Heating (Evaporation source material as indicated in the brackets)

E: Electron Beam; R:Reaction Evaperation; S:Sputtering; RS:Reaction Sputtering

EXCELLENCE IN THIN FILM PRODUCTS

Medium
refractive index

Evaporation material	Chemical Formula	Refractive Index at 550nm	Transparency Range	Shape			Melting Pointa℃	Purity	Typical Application	Recommended Evaporation Source	Risk andSafety Indication
				Granules	Tablets	Crystal granules					
Aluminium oxide	Al_2O_3	1.54	0.17-9μm	•	•		2020	99.90% 99.99%	AR coating I Glasses coating Protective coating	B(W), E	CAS No.1 344-28-1
Lanthanum fluoride	LaF_3	1.56	0.2-12μm	•	•		1490	99.90%	UV coating	B(W, Mo)	CAS No.13709-38-1 I R20/21 /22,R36/37 /38 I R64,S22,S26,S28,S36/37
Dysprosium fluoride	DyF_3	1.56	0.22-12μm	•	•		1360	99.90%			CAS No.13569-80-7
Yttrium fluoride	YF_3	1.59	0.22-14μm	•			1387	99.99%	Excellent perfonnance in infrared wavelength		CAS No.13709-49-4 I R20/21/22,R36/37/38,S22,S26,28
Samarium fluoride	SmF_3	1.59	0.22-14μm	•	•		1306	99.99%	Infrared coating	B,E	CAS No.13765-24-7
Neodymium fluoride	NdF_3	1.61	0.22-6μm	•	•		1410	99.90%	Infrared coating	B(Ta, Mo)	CAS No.13709-42-7 I R20/21 /22,R36/37 /38,S22,S26,S28
Cerium fluoride	CeF_3	1.63	0.3-0.5μm	•	•		1460	99.90%	AR coating I Glasses coating	B(W), E	R20/21/22,R36/37 /38,S22,S26,S28
Aluminium oxide+ Magenesium oxide	Al_2O_3+MgO	1.65-1.7		•	•		1473	99.90%	Higher refractive index than Al_2O_3 Easy to evaporate, various ratios available upon customers' request		CAS No.1344-28-1/1309-48-4
Tungsten oxide	WO_3	1.65-1.7	0.3-10μm	•	•		1473	99.90%	Transition coating		CAS No.1 314-3 5-8
Aluminium oxide+ Titanium dioxide	Al_2O_3+TiO_2	1.7		•	•		1127	99.90%	Higher refractive index than Al_2O_3 Easy to evaporate, various ratios ava1lable upon customers' request		CAS No.1344-28-1/13463-67-7
Stannic oxide+Platinum	SnO_2+Pt	1.7	0.17-9μm	•	•		2800	99.90%	Applied to sputtering to form sensitive film. Various ratios avaliable upon customers' request		CAS No.18282-10-5/7440-06-4
Magnesium oxide	MgO	1.7	0.23-9μm	•	•			99.90%	AR coating	B(W, Ta), E	CAS No.1309-48-4
Zirconium dioxide+ Aluminium oxide	ZrO_2+Ai_2O_3	1.7		•	•			99.99%	Resistant to chemical attack Various ratios avaliable upon customers' request		CAS No.1314-23-4/1344-28-1
Bismuth fluoride	BiF_3	1.74(1μm)	0.26-20μm	•	•		722	99.90%	Infrared coating	B(C), E	CAS No.7787-61-3
barium fluoride	$BaTiO_3$	1.66(10μm)		•	•		1620	99.99%			CAS No.12047-27-7
Tin oxide+ Aluminium oxide	SnO+Al_2O_3			•	•			99.90%	Conductive coating		CAS No.21651-19-4/1344-28-1
Strontium titanate	$SrTiO_3$			•	•			99.90%			CAS No.12060-59-2

B: Resistance Heating (Evaporation source material as indicated in the brackets)

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High refractive index

Evaporation material	Chemical Formula	Refractive Index at 550nm	Transparency Range	Shape			Melting Pointa℃	Purity	Typical Application	Recommended Evaporation Source	Risk andSafety Indication
				Granules	Tablets	Crystal granules					
Neodymium sesquioxide	Nd_2O_3	1.79	0.4-2μm	•	•		1900	99.90%	Filter and HR coating	B(W, Mo), E	CAS No.1313-97 -9
Gadolinium sesquioxide	Gd_2O_3	1.8	0.32-15μm	•	•		2340	99.90%	Smooth and firm flim applied to AR coating	RS, E	CAS No.12064-62-9
Samarium sesquioxide	Sm_2O_3	1.8		•	•		2350	99.90%	Applied to electron gun evaporation, easy to lose oxygen in the evaporat1on process Firm, compact and smooth film	E	CAS No.12060-58-1
Scandium oxide	Sc_2O_3	1.86	0.35-13μm	•	•		2300	99.90%	UV coating	E	CAS No.12060-08-1
Yttrium oxide	Y_2O_3	1.87	0.3-12μm	•	•		2410	99.99%	Insulative coating	E	CAS No.1314-36-9
Silicon monoxide	SiO	1.8-1.9	0.4-9μm	•	•		1700	99.90%	Cold light coating I Decorative coating Protective coating	B(Ta, Mo, W)	CAS No.10097-28-6
Titanium sesquioxide	Ti_2O_3	1.9-2.3	0.4-12μm	•	•	•	1800	99.90%	AR coating I Beam splitter Cold light coating Filter I HR coating I Glasses coating	RE, RS	CAS No.1344-54-3
Trititanium pentoxide	Ti_3O_5	1.9-2.3	0.4-12μm	•	•		1750	99.90%	AR coating I Beam splitter Cold light coating Filter I HR coating I Glasses coating	RE, RS	CAS No.12065-65-5
Titanium monoxide	TiO	1.9-2.3	0.4-12μm	•	•		1750	99.90%	AR coating I Beam splitter Cold light coating Filter I HR coating I Glasses coating	RE, RS	
Titanium dioxide	TiO_2	1.9-2.3	0.36-9μm	•	•		1850	99.99%	AR coating I Beam splitter Cold light coating Filter I HR coating I Glasses coating	RE, RS	CAS No.13463-67-7
Zirconium dioxide+ Yttrium oxide	ZrO_2+Y_2O_3	1.9		•	•			99.99%	Applied to electron gun to form compact and smooth film. Vanous ratios are avaliable upon customers' request		CAS No.1314-23-4/1344-28-1
Praseodymium oxide	Pr_6O_{11}	1.92-2.05	0.4-10μm	•	•		2125	99.90%	AR coating I Polarized coating	B(W), E	CAS No.12037-29-5
Zirconium dioxide	ZrO_2	1.97-2.05	0.25-9μm	•	•		2715	99.90%	Muti-layer coating I AR coating Hard coating I Glasses coating	E	CAS No.1314-23-4
Dysprosium sesquioxide	Dy_2O_3	2.0		•	•		2340	99.90%		E	CAS No.1308-87-8
Nickel oxide	NiO	2.0-2.1		•	•		1990	99.99%		B(W), S	CAS No.1313-99-1
Stannic oxide	SnO_2	2.0-2.1		•	•		1127	99.99%		B(W), E	CAS No.18282-10-5
Stannic oxide+ indium oxide	SnO_2+In_2O_3	2.0	0.3-9μm	•	•		1127	99.90%	Conductive coating		CAS No.18282-10-5/1312-43-2 I R48/20,S22
Zirconium dioxide+ Titanium dioxide	ZrO_2+TiO_2	2.05-2.15	0.36-7μm	•	•		2200-2400	99.99%		E, B(W)	CAS No.1314-23-4/13463-67-7

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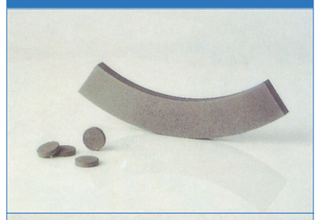
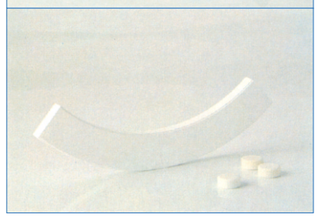
High refractive index





Evaporation material	Chemical Formula	Refractive Index at 550nm	Transparency Range	Shape			Melting Pointa℃	Purity	Typical Application	Recommended Evaporation Source	Risk andSafety Indication
				Granules	Tablets	Crystal granules					
Dichromium trioxide	Cr_2O_3	2.1		•	•		2275	99.90%	Absorbing coating	B(W), E	CAS No.1333-82-0
Lanthanum titanate	$LaTiO_3$	2.1	0.3-9μm	•	•		2200-2300	99.90%	Low temperature substrate to get multi-layer coating AR coating I Filter I Glasses coating	E, B(W)	
Columbium pentoxide	Nb_2O_5	2.1-2.3	0.35-9μm	•	•		1530	99.99%	Filter and HR coating	E	CAS No.1313-96-8
Praseodymium titanate	$PrTiO_3$	2.1	0.3-9μm	•			2200-2300	99.90%	Multi-layer coating I AR coating Glasses coating	E, B(W)	
Praseodymium dititanate	$Pr(TiO_3)_2$	2.2	0.3-9μm	•	•		2200-2300	99.90%	Low temperature substrate to get multi-layer coating AR coating		
Zirconium dioxide+ Tantalum pentoxide	ZrO_2+Ta_2O_5	2.1		•	•			99.99%	Higher refractive index than ZrO.To form compact and smooth film. Resistant to chemical attack. Various proportions avaliable to customers' request.		CAS No.1314-23-4/1314-61-0
Zinc oxide	ZnO	2.1	0.35-20μm	•	•		1975	99.90%	Conductive coating Infrared coating	B(W, Mo)	CAS No.1314-13-2
Hafnium oxide	HfO_2	2.15	0.2-9μm	•	•		2812	99.99%	AR coating I HR coating I UV coating	E, RS	CAS No.12055-23-1
Tantalum pentoxide	Ta_2O_5	2.16	0.35-9μm	•	•		1800		Filters I HR coating I Insulating coating	RE, RS	CAS No.1314-61-0
Cerium dioxide	CeO_2	2.2	0.4-12μm	•	•		1950	99.99%	AR coating	B(W), E	CAS No.1306-38-3 I R22
Titanium dioxide+ Columbium pentoxide	TiO_2+Nb_2O_5	2.2		•	•			99.99%	Applied to electron gun evaporation. Easy to handle. Various proportions are avaliable upon customers' request.	E	CAS No.13463-67-7 /1313-96-8
Titanium dioxide+ Tantalum pentoxide	TiO_2+Ta_2O_5	2.25-2.3		•	•			99.99%	Applied to electron gun evaporation. Easy to handle. Various proportions are avaliable upon customers' request.	E	CAS No.13463-67-7/1314-61-0
Dysprosium trioxide	Sb_2O_3	2.3	0.3-1μm	•	•		656	99.90%	AR coating	B(Ta, Pt)	CAS No.1327 -33-9
Vanadium trioxode	V_2O_3	2.3	0.56-7μm	•	•		690	99.90%			CAS No.1314-34-7
Zinc sulfide	ZnS	2.35	0.4-14μm	•	•		1900	99.99%	Cold light coating I Decoration coating Filter HR coating I Infrared coating	B(Ta, Mo)	CAS No.1314-98-3
Bismuth trioxide	Bi_2O_3	2.45(0.55μm) 2.2(9μm)	0.4-12μm	•	•		860	99.90%	AR coating	R(Pt), RS	Poisonous vapour
Cadmium sulfide	CdS	2.5	0.55-7μm	•	•		1750	99.90%	AR coating	B(Pt, Ta)	CAS No.1306-23-6
Cupric oxide	CuO	2.6		•	•		1326	99.90%		E	CAS No.1317-38-0
Iron troxide	Fe_2O_3	2.72		•	•		1565	99.90%		E	CAS No.1309-37-1
Cadmium+tellurium	CdTe	3.05	0.97-30	•	•		1041	99.90%	Infrared coating	B(Mo)	CAS No.7440-43-9/13494-80-9
Silicon	Si	3.4	1.0-9	•	•		1410	99.999%	Filter I AR coating I HR coating Laser coating	E, S	CAS No.7440-21-3
Cadmium+Selenium	CdSe	3.5		•	•		1350	99.99%		B(W)	CAS No.7440-43-9/7782-49-2

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