



Thin film deposition guide

Key of Symbols

* influenced by composition ** Cr-plated rod or strip ***All metals alumina coated
Gr = graphite **Q** = quartz **VC** = vitreous carbon **SS** = stainless steel **Int** = Intermetallic
Ex = excellent **G** = good **F** = fair **P** = poor **S** = sublimates **D** = decomposes
RF = RF sputtering is effective **RF-R** = reactive RF sputter is effective
DC = DC sputtering is effective
DC-R = reactive DC sputtering is effective

Remark: Data have been obtained from reliable literature sources or scientists doing vacuum deposition work. Whilst great care has been taken to ensure that the information contained in this table is accurate, data should be used as a general guide and at your own risk. Do not hesitate to use a second source for very critical data or consult us.

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Aluminum	Al	660	-	2.70	677	807	972	Ex	Gr, Int	Int, W, Al ₂ O ₃	W	W	Int	RF, DC	0,93@0,6	Alloys and wets W. Stranded W is best. Slow sputtering
Aluminum Antimonide	AlSb	1080	-	4.3	-	-	-	-	-	-	-	-	-	RF	3,62	-
Aluminum Arsenide	AlAs	1600	-	3.7	-	-	~1300	-	-	-	-	-	-	RF	-	-
Aluminum Bromide	AlBr ₃	97	-	2.64	-	-	~50	-	-	Mo	-	-	Gr	RF	-	-
Aluminum Carbide	Al ₄ C ₃	~1400	-	2.36	-	-	~800	F	-	-	-	-	-	RF	2,75@0,7	-
Aluminum Fluoride	AlF ₃	1291	S	2.88	410	490	700	P	Gr	Mo, W, Ta	-	-	Gr	RF	1,4@0,5	-
Aluminum Nitride	AlN	>2200	S/D	3.26	-	-	~1750	F	-	-	-	-	-	RF, RF-R	-	Reactive evap in 10 ⁻³ N ₂ with glow discharge. Good electrical stability.
Aluminum Oxide	Al ₂ O ₃	2072	-	3.97	-	-	1550	Ex	-	W	-	W	-	RF-R	1,63@0,55	Sapphire excellent in E-beam. Forms smooth, hard films.
Aluminum Phosphide	AlP	2000	-	2.42	-	-	-	-	-	-	-	-	-	RF	-	-
Aluminum, 2% Copper	Al2%Cu	640	-	2.82	-	-	-	-	-	-	-	-	-	RF, DC	-	Wire feed and flash. Difficult from dual sources.
Aluminum, 2% Silicon	Al2%Si	640	-	2.69	-	-	1010	G	Gr, Int	-	-	-	Int	RF, DC	-	Wire feed and flash. Difficult from dual sources.
Aluminum-doped Zinc Oxide	AZO	-	-	-	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Antimony	Sb	630	S	6.68	279	345	425	P	Gr, Al ₂ O ₃ , BN	Mo, Ta, Al ₂ O ₃ , ***	Mo, Ta	Mo, Ta	BN, C, Al ₂ O ₃	RF, DC	3,4@1	Toxic. Evaporates well. Film structure is rate dependent.
Antimony Oxide	Sb ₂ O ₃	656	S	5.2	-	-	~300	G	Al ₂ O ₃ , BN	Pt	-	Pt	BN, Al ₂ O ₃	RF-R	2,1@0,55	Toxic. Decomposes on W. Use low rate.
Antimony Selenide	Sb ₂ Se ₃	611	D	-	-	-	-	-	-	Ta	-	-	Gr	RF	3,01@0,55	Stoichiometry variable. Toxic.
Antimony Sulfide	Sb ₂ S ₃	550	-	4.64	-	-	~200	G	Al ₂ O ₃	Mo, Ta	-	Mo, Ta	-	-	3,2@055	Toxic. No decomposition.
Antimony Telluride	Sb ₂ Te ₃	629	-	6.50	-	-	600	-	-	-	-	-	Gr	RF	-	Toxic. Decomposes over 750°C.

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								Suitability	Liner	Boat	Coil	Basket	Crucible			
Arsenic	As	817	S	5.73	107	150	210	P	Gr, VC, Al2O3	Gr	-	-	Al2O3, VC	-	-	Toxic. Sublimes rapidly at low temperature.
Arsenic Oxide	As2O3	312	-	3.74	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic Selenide	As2Se3	~360	-	4.75	-	-	-	-	-	-	-	-	Q	RF	3,03@0,82	Toxic.
Arsenic Sulfide	As2S3	300	-	3.43	-	-	~400	F	Mo	Mo	-	-	Q	RF	2,69@0,56	Toxic.
Arsenic Telluride	As2Te3	362	-	-	-	-	-	-	-	Flash	-	-	-	-	-	Toxic.
Barium	Ba	725	-	3.51	287	354	462	F	-	W, Ta, Mo	W	W	Metals	RF	0,9@0,57	Toxic. Wets without alloying from refractory metals. Reacts with ceramics. Evaporates easily
Barium Chloride	BaCl2	963	-	3.92	-	-	~650	-	-	Ta, Mo	-	-	-	RF	0,74@0,58	Preheat gently to outgas.
Barium Fluoride	BaF2	1355	S	4.89	-	-	~700	G	-	-	-	-	-	RF	1,3@0,55	Density rate dependent.
Barium Oxide	BaO	1918	-	5.72	-	-	~1300	P	Al2O3	Pt	-	Pt	Al2O3	RF, RF-R	1,98@0,59	Decomposes slightly.
Barium Sulfide	BaS	1200	-	4.25	-	-	1100	-	-	Mo	-	-	-	RF	2,16@,59	-
Barium Titanate	BaTiO3	-	D	6.02	-	-	-	-	-	-	-	-	-	RF	2,4@0,55	Gives Ba. Co-evap. from 2 sources or sputter.
Beryllium	Be	1278	-	1.85	699	827	987	Ex	Gr, VC	W, Ta	W	W	BeO, Gr, VC	RF, DC	2,5@0,5	Wets W/Mo/Ta. Powder and oxides toxic. Evaporates easily.
Beryllium Carbide	Be2C	>2100	D	1.90	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium Chloride	BeCl2	405	-	1.90	-	-	~150	-	-	-	-	-	-	RF	-	Toxic.
Beryllium Fluoride	BeF2	800	S	1.99	-	-	~200	G	-	-	-	-	-	-	1,33@0,59	-
Beryllium Oxide	BeO	2530	-	3.01	-	-	1900	G	-	-	-	W	-	RF, RF-R	1,72@0,55	Toxic powder. No decomposition from E-beam guns.
Bismuth	Bi	271	-	9.80	330	410	520	G	VC, Al2O3	W, Mo, Ta, Al2O3	W	W	Al2O3, VC	DC, RF	2,61@0,8	Toxic vapor. High resistivity. No shorting of baskets.
Bismuth Fluoride	BiF3	727	S	5.32	-	-	~300	-	-	-	-	-	-	RF	1,7@0,55	Toxic.
Bismuth Oxide	Bi2O3	860	-	8.55	-	-	~1400	P	-	Pt	-	Pt	-	RF, RF-R	1,9@0,55	Toxic vapor.

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								Suitability	Liner	Boat	Coil	Basket	Crucible			
Bismuth Selenide	Bi ₂ Se ₃	710	D	6.82	-	-	~650	G	Gr	-	-	-	Gr, Q	RF	-	Toxic. Co-evaporate from two sources or sputter.
Bismuth Sulfide	Bi ₂ S ₃	685	D	7.39	-	-	-	-	-	-	-	-	-	RF	1,5	Toxic.
Bismuth Telluride	Bi ₂ Te ₃	573	D	7.7	-	-	~600	-	Gr	W, Mo	-	-	Gr, Q	RF	-	Toxic. Co-evaporate from two sources or sputter.
Bismuth Titanate	Bi ₂ Ti ₂ O ₇	-	D	-	-	-	-	-	-	-	-	-	-	RF	-	Toxic. Sputter or co-evaporate from two sources in 10 ⁻² Torr oxygen.
Boron	B	2300	-	2.34	1278	1548	1797	G	-	Gr	-	-	Gr, VC	RF	-	Explodes with rapid cooling. Forms carbide with Gr. Boats must be heated.
Boron Carbide	B ₄ C	2350	-	2.52	2500	2580	2650	Ex	-	-	-	-	-	RF	-	Similar to chromium. Films very adherent. Sputter quickly
Boron Nitride	BN	~3000	S	2.25	-	-	~1600	P	-	-	-	-	-	RF, RF-R	-	Decomposes under sputtering; sensitive to thermic shocks. Sputtering preferred.
Boron Oxide	B ₂ O ₃	~450	-	1.81	-	-	~1400	G	-	Pt, Mo	-	-	-	-	1,46	-
Boron Sulfide	B ₂ S ₃	310	-	1.55	-	-	800	-	-	-	-	-	Gr	RF	-	-
Cadmium	Cd	321	-	8.64	64	120	180	F	Al ₂ O ₃	W, Mo, Ta	-	W, Mo, Ta	Al ₂ O ₃ , Q	DC, RF	1,13@0,6	Bad for vacuum systems. Low sticking coefficient.
Cadmium Antimonide	Cd ₃ Sb ₂	456	-	6.92	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium Arsenide	Cd ₃ As ₂	721	-	6.21	-	-	-	-	-	-	-	-	Q	RF	-	Toxic.
Cadmium Bromide	CdBr ₂	567	-	5.19	-	-	~300	-	-	-	-	-	-	-	-	-
Cadmium Chloride	CdCl ₂	568	-	4.05	-	-	~400	-	-	-	-	-	-	-	-	-
Cadmium Fluoride	CdF ₂	1100	-	6.64	-	-	~500	-	-	-	-	-	-	RF	1,56@0,58	-
Cadmium Iodide	CdI ₂	387	-	5.67	-	-	~250	-	-	-	-	-	-	-	-	-
Cadmium Oxide	CdO	>1500	D	6.95	-	-	~530	-	-	-	-	-	-	RF-R	2,49@0,67	Reactive RF (O ₂ + Ar) or (O ₂ + N ₂).
Cadmium Selenide	CdSe	>1350	S	5.81	-	-	540	G	Al ₂ O ₃	Mo, Ta	-	-	Al ₂ O ₃ , Q	RF	2,4@0,58	Toxic. Evaporates easily.

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Cadmium Sulfide	CdS	1750	S	4.82	-	-	550	F	Gr, Al2O3	W, Mo, Ta	-	W	Al ₂ O ₃ , Q	RF	2,5@0,55	Sticking coefficient affected by substrate temperature. Stoichiometry variable.
Cadmium Telluride	CdTe	1121	-	5.85	-	-	450	-	-	W, Mo, Ta	W	Ta, Mo	-	RF	2,6	Toxic. Stoichiometry depends on substrate temperature.
Calcium	Ca	839	S	1.54	272	357	459	P	Al2O3	W	W	W	Al ₂ O ₃ , Q	-	0,29@0,58	Flammable. Corrodes in air.
Calcium Fluoride	CaF ₂	1423	-	3.18	-	-	~1100	-	-	W, Mo, Ta	W, Mo, Ta	W, Mo, Ta	Q	RF	1,4@0,55	Rate control important. Preheat gently to outgas.
Calcium Oxide	CaO	2614	-	~3.3	-	-	~1700	-	-	W, Mo	-	-	ZrO ₂	RF, RF-R	1,84@0,59	Forms volatile oxides with tungsten and molybdenum.
Calcium Silicate	CaSiO ₃	1540	-	2.91	-	-	-	G	-	-	-	-	Q	RF	-	-
Calcium Sulfide	CaS	-	D	2.5	-	-	1100	-	-	Mo	-	-	-	RF	2,14@0,59	-
Calcium Titanate	CaTiO ₃	1975	-	4.10	1490	1600	1690	P	-	-	-	-	-	RF	2,34@0,59	Disproportionates except in sputtering.
Calcium Tungstate	CaWO ₄	-	-	6.06	-	-	-	G	-	W	-	-	-	RF	1,92@0,59	-
Carbon	C	~3652	S	1.8-2.1	1677	1867	2107	G	-	-	-	-	-	RF	1,47	E-beam preferred. Arc evaporation. Poor film adhesion.
Cerium	Ce	798	-	~6.70	970	1150	1380	G	Al2O3, VC	W, Ta	W	W, Ta	Al ₂ O ₃ , VC	DC, RF	1,91@0,59	Films oxide easily
Cerium (III) Oxide	Ce ₂ O ₃	1692	-	6.86	-	-	-	F	-	W	-	-	-	-	2,18@0,58	Alloys with source. Use 0.015"-0.020" tungsten boat. E-beam gun preferred.
Cerium (IV) Oxide	CeO ₂	~2600	S	7.13	1890	2000	2310	G	Gr	W	-	-	-	RF, RF-R	2,18@0,55	Very little decomposition. Use 250°C substrate temperature.
Cerium Fluoride	CeF ₃	1460	-	6.16	-	-	~900	G	-	W, Mo, Ta	-	Mo, Ta	-	RF	1,63@0,55	Preheat gently to outgas.
Cesium	Cs	28	-	1.88	-17	22	75	-	-	SS	-	-	Q	-	-	Flammable.
Cesium Bromide	CsBr	636	-	3.04	-	-	~400	-	-	W	-	-	-	RF	-	-
Cesium Chloride	CsCl	645	-	3.99	-	-	~500	-	-	W	-	-	-	RF	-	Hygroscopic.
Cesium Fluoride	CsF	682	-	4.12	-	-	~500	-	-	W	-	-	-	RF	1,5@0,55	-

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								Suitability	Liner	Boat	Coil	Basket	Crucible			
Cesium Hydroxide	CsOH	272	-	3.68	-	-	550	-	-	Pt	-	-	-	-	-	-
Cesium Iodide	CsI	626	-	4.51	-	-	~500	-	-	W	-	-	-	RF	1,99@0,23	-
Chiolote	Na ₅ Al ₃ F ₁₄	-	-	2.9	-	-	~800	-	-	Mo, W	-	-	-	RF	-	-
Chromium	Cr	1857	S	7.20	852	977	1162	G	Gr, VC	**	W	W	VC	RF, DC	3,28@0,7	Films very adherent. High rates possible.
Chromium Boride	CrB	2760	-	6.17	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Chromium Bromide	CrBr ₂	842	-	4.36	-	-	550	-	-	-	-	-	-	RF	-	-
Chromium Carbide	Cr ₃ C ₂	1980	-	6.68	-	-	~2000	F	-	W	-	-	-	RF, DC	-	-
Chromium Chloride	CrCl ₂	824	-	2.88	-	-	550	-	-	Fe	-	-	-	RF	-	Sublimes easily
Chromium Oxide	Cr ₂ O ₃	2266	-	5.21	-	-	~2000	G	-	W, Mo	-	W	-	RF, RF-R	2,55@0,59	Disproportionates to lower oxides; reoxidizes at 600°C in air.
Chromium Silicide	Cr ₃ Si ₂	-	-	5.5	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Chromium-Silicon Monoxide	Cr-SiO	-	-	*	*	*	*	G	-	W	-	W	-	DC, RF	-	Flash.
Cobalt	Co	1495	-	8.9	927	1072	1262	Ex	Al ₂ O ₃	W	-	W	Al ₂ O ₃	DC, RF	2,17@0,62	Alloys with refractory metals.
Cobalt Bromide	CoBr ₂	678	S	4.91	-	-	400	-	-	-	-	-	-	RF	-	-
Cobalt Chloride	CoCl ₂	724	S	3.36	-	-	472	-	-	-	-	-	-	RF	1,51@0,63	-
Cobalt Oxide	CoO	1795	-	6.45	-	-	-	-	-	-	-	-	-	DC-R, RF-R	-	Sputter preferred.
Copper	Cu	1083	-	8.92	727	857	1017	Ex	Gr, Al ₂ O ₃ , Mo, Ta	Mo	W	W	Al ₂ O ₃ , Int	DC, RF	0,17@0,8	Adhesion poor. Use interlayer (Cr). Evaporates using any source material.
Copper Chloride	CuCl	430	-	4.14	-	-	~600	-	-	-	-	-	-	RF	1,93	-
Copper Oxide	Cu ₂ O	1235	S	6.0	-	-	~600	G	Al ₂ O ₃	Ta	-	-	Al ₂ O ₃	DC-R, RF-R	2,71@0,59	Evaporate in 10-2 to 104 of O ₂ .
Copper Sulfide	Cu ₂ S	1100	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-
Cryolite	Na ₃ AlF ₆	1000	-	2.9	1020	1260	1480	Ex	Gr, VC	W, Mo, Ta	-	W, Mo, Ta	VC	RF	1,35@0,55	Large chunks reduce spitting. Little decomposition.
Dysprosium	Dy	1412	S	8.55	625	750	900	G	-	Ta	-	-	-	RF, DC	-	Flammable.
Dysprosium Fluoride	DyF ₃	1360	S	-	-	-	~800	G	-	Ta	-	-	-	RF	1,6@0,55	-

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Dysprosium Oxide	Dy ₂ O ₃	2340	-	7.81	-	-	~1400	-	-	Ir	-	-	-	RF, RF-R	1,9@0,55	Loses oxygen.
Erbium	Er	1529	S	9.07	650	775	930	G	-	W, Ta	-	-	-	DC, RF	-	-
Erbium Fluoride	ErF ₃	1350	-	-	-	-	~750	-	-	-	-	-	-	RF	1,5@0,55	-
Erbium Oxide	Er ₂ O ₃	Infus.	-	8.64	-	-	~1600	-	-	Ir	-	-	-	RF, RF-R	1,9@0,55	Loses oxygen.
Europium	Eu	822	-	5.24	280	360	460	F	Al ₂ O ₃	W, Ta	-	-	Al ₂ O ₃	RF, DC	-	Flammable. Low tantalum solubility.
Europium Fluoride	EuF ₂	1380	-	6.50	-	-	~950	-	-	Mo	-	-	-	RF	-	-
Europium Oxide	Eu ₂ O ₃	-	-	7.42	-	-	~1600	G	W	Ir, Ta, W	-	-	ThO ₂	RF, RF-R	1,9@0,55	Loses oxygen. Films clear and hard.
Europium Sulfide	EuS	-	-	5.75	-	-	-	G	-	-	-	-	-	RF	-	-
Gadolinium	Gd	1313	-	7.90	760	900	1175	Ex	Al ₂ O ₃	Ta	-	-	Al ₂ O ₃	RF, DC	-	Flammable. High tantalum solubility.
Gadolinium Carbide	GdC ₂	-	-	-	-	-	1500	-	-	-	-	-	Gr	RF	-	Decomposes under sputtering.
Gadolinium Oxide	Gd ₂ O ₃	2330	-	7.41	-	-	-	F	-	Ir	-	-	-	RF, RF-R	1,8@0,55	Loses oxygen.
Gallium	Ga	30	-	5.90	619	742	907	G	Gr, VC, Al ₂ O ₃	-	-	-	Al ₂ O ₃ , Q	-	-	Alloys with refractory metals. Use E-beam gun. Attack crucibles above 1000°C
Gallium Antimonide	GaSb	710	-	5.6	-	-	-	F	-	W, Ta	-	-	-	RF	3,8@2,2	Flash evaporate.
Gallium Arsenide	GaAs	1238	-	5.3	-	-	-	G	Gr	W, Ta	-	-	Gr	RF	3,34@0,78	Flash evaporate.
Gallium Nitride	GaN	800	S	6.1	-	-	~200	-	-	-	-	-	Al ₂ O ₃	RF, RF-R	-	Evaporates gallium in 10-3 Torr nitrogen.
Gallium Oxide	Ga ₂ O ₃	1900	-	6.44	-	-	-	-	-	Pr, W	-	-	-	RF	-	Loses oxygen.
Gallium Phosphide	GaP	1540	-	4.1	-	770	920	-	-	W, Ta	-	W	Q	RF	3@2,15	Does not decompose. Rate control important.
Germanium	Ge	937	-	5.35	812	952	1142	Ex	Gr, Al ₂ O ₃	W, Gr, Ta	-	-	Q, Al ₂ O ₃	DC, RF	4@2	Excellent films from E-beam guns. Wets W, Ta and Mo.
Germanium (II) Oxide	GeO	710	-	-	-	-	500	-	-	-	-	-	Q	RF	-	-

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Germanium (III) Oxide	GeO ₂	1086	-	6.24	-	-	~625	G	VC, Al ₂ O ₃	Ta, Mo	-	W, Mo	Q, Al ₂ O ₃	RF-R	1,61@0,59	Similar to SiO ₂ ; film predominantly GeO.
Germanium Nitride	Ge ₃ N ₂	450	S	5.2	-	-	~650	-	-	-	-	-	-	RF-R	-	Sputtering preferred.
Germanium Telluride	GeTe	725	-	6.20	-	-	381	-	-	W, Mo	-	W	Q, Al ₂ O ₃	RF	-	-
Glass, Schott 8329	-	-	-	2.20	-	-	-	Ex	-	-	-	-	-	RF	1,47	Evaporable alkali glass. Melt in air before evaporating.
Gold	Au	1064	-	19.32	807	947	1132	Ex	Gr, VC, Al ₂ O ₃ , BN	W	W	W*** Mo***	Al ₂ O ₃ , BN, VC	DC, RF	0,2@0,6	Films soft, not very adherent. Wets W and Mo. Sputtering preferred
Hafnium	Hf	2227	-	13.31	2160	2250	3090	G	-	-	-	-	-	DC, RF	-	-
Hafnium Boride	HfB ₂	3250	-	10.5	-	-	-	-	-	-	-	-	-	DC, RF	-	-
Hafnium Carbide	HfC	~3890	S	12.20	-	-	~2600	-	-	-	-	-	-	DC, RF	-	-
Hafnium Nitride	HfN	3305	-	-	-	-	-	-	-	-	-	-	-	RF, RF-R	-	-
Hafnium Oxide	HfO ₂	2758	-	9.68	-	-	~2500	F	-	W	-	-	-	DC, RF, RF-R	1,9@0,55	Film HfO.
Hafnium Silicide	HfSi ₂	1750	-	7.2	-	-	-	-	-	-	-	-	-	RF	-	-
Holmium	Ho	1474	S	8.80	650	770	950	G	-	W, Ta	W	W	-	-	-	-
Holmium Fluoride	HoF ₃	1143	-	-	-	-	~800	-	-	-	-	-	Q	DC, RF	1,6@0,55	-
Holmium Oxide	Ho ₂ O ₃	2370	-	8.41	-	-	-	-	-	Ir	-	-	-	RF, RF-R	1,9@0,55	Loses oxygen.
Inconel	Ni/Cr/Fe	1425	-	8.5	-	-	-	G	-	W	W	W	-	DC, RF	-	Use fine wire wrapped on tungsten. Low rate required for smooth films.
Indium	In	157	-	7.30	487	597	742	Ex	Gr, Al ₂ O ₃ , Mo	W, Mo	-	W	Gr, Al ₂ O ₃	DC, RF	1,38@0,71	Wets tungsten and copper
Indium (I) Oxide	In ₂ O	~600	S	6.99	-	-	650	-	-	-	-	-	-	RF	-	Decomposes under sputtering.
Indium (I) Sulfide	In ₂ S	653	-	5.87	-	-	650	-	-	-	-	-	Gr	RF	2	-
Indium (II) Sulfide	InS	692	S	5.18	-	-	650	-	-	-	-	-	Gr	RF	-	-
Indium (II) Telluride	InTe	696	-	6.29	-	-	-	-	-	-	-	-	-	-	-	-

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Indium (III) Oxide	In ₂ O ₃	850	-	7.18	-	-	~1200	G	Al ₂ O ₃	W, Pt	-	-	Al ₂ O ₃	-	2@0,55	Film In ₂ O. Transparent conductor.
Indium (III) Sulfide	In ₂ S ₃	1050	S	4.90	-	-	850	-	-	-	-	-	Gr	RF	-	Film In ₂ S.
Indium (III) Telluride	In ₂ Te ₃	667	-	5.78	-	-	-	-	-	-	-	-	-	RF	-	Sputtering preferred; or co-evaporate from two sources; flash.
Indium Antimonide	InSb	535	D	5.8	-	-	-	-	-	W	-	-	-	RF	1@0,55	Toxic. Sputter preferred or co-evaporate on heated substrat 900°C . Flash
Indium Arsenide	InAs	943	D	5.7	780	870	970	-	-	W	-	-	-	RF	4,5@1	Toxic. Sputtering preferred or co-evap from 2 sources. Flash
Indium Nitride	InN	1200	-	7.0	-	-	-	-	-	-	-	-	-	RF	-	-
Indium Phosphide	InP	1070	-	4.8	-	630	730	-	-	W, Ta	-	W, Ta	Gr	RF	3@2	Deposits are phosphorus rich. Flash evaporate.
Indium Selenide	In ₂ Se ₃	890	-	5.67	-	-	-	-	-	-	-	-	-	RF	-	Sputtering preferred; or co-evaporate from two sources; flash.
Indium Tin Oxide	In ₂ O ₃ -SnO ₂	1800	S	-	-	-	-	-	-	-	-	-	-	-	-	-
Iridium	Ir	2410	-	22.42	1850	2080	2380	F	W	-	-	-	W	DC, RF	-	-
Iron	Fe	1535	-	7.86	877	1017	1207	Ex	VC, Al ₂ O ₃	W	W	W	Al ₂ O ₃	DC, RF	2@0,58	Attacks tungsten. Films hard, smooth. Preheat gently to outgas.
Iron (II) Oxide	FeO	1369	D	5.7	-	-	-	P	-	-	-	-	-	RF, RF-R	2,32@,59	Sputtering preferred.
Iron (III) Oxide	Fe ₂ O ₃	1565	-	5.24	-	-	-	G	-	W	-	W	-	-	3@0,55	Disproportionates to Fe ₃ O ₄ at 1530°C.
Iron Bromide	FeBr ₂	684	-	4.64	-	-	561	-	-	-	-	-	-	RF	-	-
Iron Chloride	FeCl ₂	670	S	3.16	-	-	300	-	-	-	-	-	-	RF	1,57@0,59	-
Iron Iodide	FeI ₂	-	-	5.32	-	-	400	-	-	-	-	-	-	RF	-	-
Iron Sulfide	FeS	1193	D	4.74	-	-	-	-	-	-	-	-	Al ₂ O ₃	RF	-	-

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Kanthal	FeCrAl	-	-	7.1	-	-	-	-	-	W	W	-	-	DC, RF	1,74@0,58	-
Lanthanum	La	921	-	6.15	990	1212	1388	Ex	Al2O3	W, Ta	-	-	Al ₂ O ₃	RF	-	Films will burn in air if scraped.
Lanthanum Boride	LaB ₆	2210	-	2.61	-	-	-	G	-	-	-	-	-	RF	-	Toxic.
Lanthanum Bromide	LaBr ₃	783	-	5.06	-	-	-	-	-	-	-	Ta	-	RF	-	Hygroscopic.
Lanthanum Fluoride	LaF ₃	1490	S	~6.0	-	-	900	G	-	Ta, Mo	-	Ta	-	RF	1,6@0,55	No decomposition. Heat substrate over 300°C.
Lanthanum Oxide	La ₂ O ₃	2307	-	6.51	-	-	1400	G	-	W, Ta	-	-	-	RF	1,9@0,55	Loses oxygen.
Lead	Pb	328	-	11.34	342	427	497	Ex	Gr, Al2O3	W, Mo	W	W, Ta	Al ₂ O ₃ , Q	DC, RF	1,51@0,8	Toxic.
Lead Bromide	PbBr ₂	373	-	6.66	-	-	~300	-	-	-	-	-	-	-	-	Toxic.
Lead Chloride	PbCl ₂	501	-	5.85	-	-	~325	-	-	Pt	-	-	Al ₂ O ₃	RF	2,3@0,55	Toxic. Little decomposition.
Lead Fluoride	PbF ₂	855	S	8.24	-	-	~400	-	-	W, Pt, Mo	-	-	Al2O3	RF	1,75@0,55	Toxic.
Lithium	Li	181	-	0.53	227	307	407	G	Al2O3	Ta, SS	-	-	Al2O3	-	-	Metal reacts quickly in air.
Lithium Bromide	LiBr	550	-	3.46	-	-	~500	-	-	Ni	-	-	-	RF	1,78@0,59	-
Lithium Iodide	LiI	449	-	4.08	-	-	400	-	-	Mo, W	-	-	-	RF	1,96@0,59	-
Lithium Oxide	Li ₂ O	>1700	-	2.01	-	-	850	-	-	Pt, Ir	-	-	-	RF	1,64@0,59	-
Lutetium	Lu	1663	S	9.84	-	-	1300	Ex	Al2O3	Ta	-	-	Al ₂ O ₃	RF, DC	-	-
Lutetium Oxide	Lu ₂ O ₃	-	D	9.42	-	-	1400	-	-	Ir	-	-	-	RF	1,9@0,55	-
Magnesium	Mg	649	S	1.74	185	247	327	G	VC, Al2O3	W, Mo, Ta	W	W	Al ₂ O ₃ , VC	DC, RF	0,52@0,4	Flammable. Extremely high rates possible. Sputtering possible but enough slow
Magnesium Aluminate	MgAl ₂ O ₄	2135	-	3.6	-	-	-	G	-	-	-	-	-	RF	-	Natural spinel.
Magnesium Bromide	MgBr ₂	700	D	3.72	-	-	~450	-	-	Ni	-	-	-	RF	-	-
Magnesium Chloride	MgCl ₂	714	D	2.32	-	-	400	-	-	Ni	-	-	-	RF	1,6	-

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Magnesium Fluoride	MgF ₂	1261	-	2.9-3.2	-	-	1000	Ex	Al ₂ O ₃	-	-	-	Al ₂ O ₃	RF	1,38@0,55	Rate control and substrate heat important for optical films. Reacts with tungsten. Excellent with molybdenum.
Magnesium Iodide	MgI ₂	<637	-	4.43	-	-	200	-		Pr	-	-	-	RF	-	-
Magnesium Oxide	MgO	2852	-	3.58	-	-	1300	G	Al ₂ O ₃	-	-	-	Gr, Al ₂ O ₃	RF, RF-R	1,7@055	Evaporates in 10 ⁻³ Torr oxygen for stoichiometry. Tungsten gives volatile oxides.
Manganese	Mn	1244	S	7.20	507	572	647	G	Al ₂ O ₃	W, Ta, Mo	W	W	Al ₂ O ₃	DC, RF	2,59@0,59	Flammable. Wets refractair metals
Manganese (III) Oxide	Mn ₂ O ₃	1080	-	4.50	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (IV) Oxide	MnO ₂	535	-	5.03	-	-	-	P	-	W	-	W	-	RF-R	-	Loses oxygen at 535°C.
Manganese Bromide	MnBr ₂	-	-	4.39	-	-	500	-	-	-	-	-	-	RF	-	-
Manganese Chloride	MnCl ₂	650	-	2.98	-	-	450	-	-	-	-	-	-	RF	-	-
Manganese Sulfide	MnS	-	D	3.99	-	-	1300	-	-	Mo	-	-	-	RF	2,7	-
Mercury	Hg	-39		13.55	-68	-42	-6	-	-	-	-	-	-	-	-	Toxic
Mercury Sulfide	HgS	584	S/D	8.10	-	-	250	-	-	-	-	-	Al ₂ O ₃	RF	-	Toxic.
Molybdenum	Mo	2610	-	10.2	1592	1822	2117	Ex	Gr	-	-	-	-	DC, RF	3,65@,59	Films smooth, hard. Careful degas required.
Molybdenum Boride	MoB ₂	2100	-	7.12	-	-	-	P	-	-	-	-	-	RF, DC	-	-
Molybdenum Carbide	Mo ₂ C	2687	-	8.9	-	-	-	F	-	-	-	-	-	RF, DC	-	Evaporation of Mo(CO) ₆ yields Mo ₂ C.
Molybdenum Disulfide	MoS ₂	1185	-	4.80	-	-	~50	-	-	-	-	-	-	RF	-	-
Molybdenum Oxide	MoO ₃	795	-	4.69	-	-	~900	-	Al ₂ O ₃ , Mo	Mo, Pt	-	Mo	Al ₂ O ₃ , BN	RF	1,9@0,55	Slight oxygen loss.

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Molybdenum Silicide	MoSi ₂	2050	D	6.31	-	-	-	-		W	-	-	-	RF	1,9	Slight O2 loss.
Neodymium	Nd	1021	-	7.01	731	871	1062	Ex	Al ₂ O ₃	Ta	-	-	Al ₂ O ₃	DC, RF	0,3@0,88	Flammable. Low tantalum solubility.
Neodymium Fluoride	NdF ₃	1410	-	6.5	-	-	~900	G	Al ₂ O ₃	Mo, W	-	Mo, Ta	Al ₂ O ₃	RF	1,61@0,55	Very little decomposition.
Neodymium Oxide	Nd ₂ O ₃	~1900	-	7.24	-	-	~1400	G	W	Ta, W	-	-	W	RF, RF-R	2@0,55	Loses oxygen. Films clear. E-beam preferred. Hygroscopic. N varies with substrate temperature.
Nickel	Ni	1455	-	8.90	927	1072	1262	Ex	VC, Al ₂ O ₃	W	W	W	Al ₂ O ₃ , VC	DC, RF	2,37@0,81	Alloys with refractory metals. Forms smooth adherent films.
Nickel Bromide	NiBr ₂	963	S	5.10	-	-	362	-	-	-	-	-	-	RF		-
Nickel Chloride	NiCl ₂	1001	S	3.55	-	-	444	-	-	-	-	-	-	RF		-
Nickel Oxide	NiO	1984	-	6.67	-	-	~1470	-	Al ₂ O ₃	-	-	-	Al ₂ O ₃	RF-R	2,18@0,48	Dissociates on heating.
Nichrome IV	Ni/Cr	1395	-	8.50	847	987	1217	Ex	Gr, VC, Al ₂ O ₃	***	W	W, Ta	Al ₂ O ₃ , VC	DC, RF	3,74@8,8	Alloys with refractory metals.
Niobium	Nb	2468	-	8.57	1728	1977	2287	Ex	-	W	-	-	-	DC, RF	1,8@0,58	Attacks tungsten source.
Niobium (II) Oxide	NbO	-	-	7.30	-	-	1100	-	-	Pt	-	-	-	RF	-	-
Niobium (III) Oxide	Nb ₂ O ₃	1780	-	7.5	-	-	-	-	-	W	-	W	-	RF, RF-R	-	-
Niobium (V) Oxide	Nb ₂ O ₅	1485	-	4.47	-	-	-	-	-	W	-	W	-	RF, RF-R	2,3@0,55	-
Niobium Boride	NbB ₂	2900(?)	-	6.97	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Niobium Carbide	NbC	3500	-	7.6	-	-	-	F	-	-	-	-	-	RF, DC	-	-
Niobium Nitride	NbN	2573	-	8.4	-	-	-	-	-	-	-	-	-	RF, RF-R	-	Sputters reactive or evaporates niobium in 10 ⁻³ Torr nitrogen.
Niobium Telluride	NbTe _x	-	-	7.6	-	-	-	-	-	-	-	-	-	RF	-	Composition variable.
Niobium-Tin	Nb ₃ Sn	-	-	-	-	-	-	Ex	-	-	-	-	-	RF, DC	-	Co-evaporate from two sources.
Osmium	Os	2700	-	22.48	2170	2430	2760	F	-	-	-	-	-	DC, RF	-	Toxic.
Osmium Oxide	Os ₂ O ₃	-	D	-	-	-	-	-	-	-	-	-	-	-	-	Deposits osmium in 10 ⁻³ Torr oxygen.

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Palladium	Pd	1554	S	12.02	842	992	1192	Ex	Gr, Al2O3	W	W	W	Al ₂ O ₃	DC, RF	2,3@,54	Alloys with refractory metals. Rapid evaporation suggested. Spits en EB.
Palladium Oxide	PdO	870	D	9.70	-	-	575	-	Al2O3	-	-	-	Al ₂ O ₃	RF-R	-	-
Parylene	C ₈ H ₈	300-400	-	1.1	-	-	-	-	-	-	-	-	-	-	-	Vapor-depositable plastic.
Permalloy	Ni/Fe	1395	-	8.7	947	1047	1307	G	VC, Al2O3	W	-	-	Al ₂ O ₃ , VC	DC, RF	-	Film low in nickel. Use 84% Ni source.
Phosphorus	P	44.1	-	1.82	54	88	129	-	-	-	-	-	Al ₂ O ₃	-	-	Material reacts violently in air.
Phosphorus Nitride	P ₃ N ₅	-	-	2.51	-	-	-	-	-	-	-	-	-	RF, RF-R	-	-
Platinum	Pt	1772	-	21.45	1292	1492	1747	Ex	Gr, W	W	W, Pt	W	Gr, W	DC, RF	3,42@1,0	Alloys with metals. Films soft, poor adhesion. EB required.
Platinum Oxide	PtO ₂	450	-	10.2	-	-	-	-	-	-	-	-	-	RF-R	-	-
Plutonium	Pu	641	-	19.84	-	-	-	-	-	W	-	-	-	DC, RF	-	Toxic, radioactive.
Polonium	Po	254	-	9.4	117	170	244	-	-	-	-	-	Q	-	-	Radioactive.
Potassium	K	63	-	0.86	23	60	125	-	-	Mo	-	-	Q	-	0,74@0,25	Metal reacts rapidly in air. Preheat gently to outgas.
Potassium Bromide	KBr	734	-	2.75	-	-	~450	-	-	Ta, Mo	-	-	Q	RF	1,56@0,48	Preheat gently to outgas.
Potassium Chloride	KCl	770	-	1.98	-	-	510	F	-	Ta, Ni	-	-	-	RF	1,72@0,2	Preheat gently to outgas.
Potassium Fluoride	KF	858	-	2.48	-	-	~500	P	-	-	-	-	Q	RF	1,35@1,4	Preheat gently to outgas.
Potassium Hydroxide	KOH	360	-	2.04	-	-	~400	-	-	Pt	-	-	-	-	-	Preheat gently to outgas. Hygroscopic.
Potassium Iodide	KI	681	-	3.13	-	-	~500	-	-	Ta	-	-	-	RF	1,92@0,27	Preheat gently to outgas.
Praseodymium	Pr	931	-	6.77	800	950	1150	F	-	Ta	-	-	-	RF, DC		Flammable
Praseodymium Oxide	Pr ₂ O ₃	-	-	7.07	-	-	1400	G	W	Ir	-	-	W	RF, RF-R	2@0,55	Loses oxygen.
Radium	Ra	700	-	5 (?)	246	320	416	-	-	-	-	-	-	-		-
Rhenium	Re	3180	-	20.53	1928	2207	2571	G	-	-	-	-	-	DC, RF	3,18@0,59	Fine wire will self-evaporate.
Rhenium Oxide	ReO ₃	-	-	~7	-	-	-	-	-	-	-	-	-	RF		Evaporate rhenium in 10 ⁻³ Torr
Rhodium	Rh	1966	-	12.4	1277	1472	1707	G	VC, W	W	W	W	W, VC	DC, RF	2,03@0,8	E-beam gun preferred.
Rubidium	Rb	39	-	1.48	-3	37	111	-	-	-	-	-	Q	DC, RF	1,03@0,25	-

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					10-8	10-6	10-4	E-Beam		Thermal Sources							
								Suitability	Liner	Boat	Coil	Basket	Crucible				
Rubidium Chloride	RbCl	718	-	2.09	-	-	~550	-	-	-	-	-	-	Q	RF	1,49	-
Rubidium Iodide	RbI	647	-	3.55	-	-	~400	-	-	-	-	-	-	Q	RF	1,68@0,58	-
Ruthenium	Ru	2310	-	12.3	1780	1990	2260	P	-	W	-	-	-	-	DC, RF	-	Spit violently in EB. Require long degas.
Samarium	Sm	1074	-	7.52	373	460	573	G	Al2O3	Ta	-	-	Al ₂ O ₃	RF, DC	-	-	
Samarium Oxide	Sm ₂ O ₃	2350	-	8.35	-	-	-	G	W	Ir	-	-	W	RF, RF-R	1,9@0,55	Loses oxygen. Films smooth, clear.	
Samarium Sulfide	Sm ₂ S ₃	1900	-	5.73	-	-	-	G	-	-	-	-	-	-	-	-	-
Scandium	Sc	1541	S	2.99	714	920	1100	Ex	Al2O3	W	-	-	Al2O3	RF	-	Flammable. Alloys with tantalum.	
Scandium Oxide	Sc2O3	2300	-	3.86	-	-	~400	F	-	-	-	-	-	RF, RF-R	1,89@0,55	Loses oxygen.	
Selenium	Se	217	-	4.81	89	125	170	G	Gr, VC, Al2O3	W, Mo	W, Mo	W, Mo	Al2O3, VC	RF, DC	2,78	Toxic. Bad for vacuum systems. Wets all sources	
Silicon	Si	1410	-	2.32	992	1147	1337	G	VC, Ta	W, Ta	-	-	BeO, Ta, VC	DC, RF	4,06@0,8	Alloys with tungsten; use heavy tungsten boat. SiO produced above 4 x 10 ⁻⁶ Torr. E-beam preferred	
Silicon (II) Oxide	SiO	>1702	S	2.13	-	-	850	G	Gr, Ta	Ta	W	W	Ta	RF, RF-R	1,9@2	For resistance evaporation, use baffle box and low rate. E-beam preferred.	
Silicon (IV) Oxide	SiO ₂	1610	-	~2.65	*	*	1025*	Ex	Gr, Al2O3	-	-	-	Al ₂ O ₃	RF	1,46@0,55	Quartz excellent in E-beam.	
Silicon Boride	SiB4	-	-	-	-	-	-	P	-	-	-	-	-	RF	-	-	
Silicon Carbide	SiC	~2700	-	3.22	-	-	1000	-	-	-	-	-	-	RF	2,7@0,55	Sputtering preferred.	
Silicon Nitride	Si3N4	1900	S	3.44	-	-	~800	-	-	-	-	-	-	RF, RF-R	2@0,12	-	
Silicon Selenide	SiSe	-	-	-	-	-	550	-	-	-	-	-	Q	RF	-	Toxic	
Silicon Sulfide	SiS	940	S	1.85	-	-	450	-	-	-	-	-	Q	RF	-	-	
Silicon Telluride	SiTe ₂	-	-	4.39	-	-	550	-	-	-	-	-	Q	RF	-	Toxic	

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Silver	Ag	962	-	10.5	574	685	832	Ex	Gr, VC, Al2O3, Mo	W	Mo	Ta, Mo	Al ₂ O ₃	DC, RF	0,06@0,6	Evaporates well from any source.
Silver Bromide	AgBr	432	-	6.47	-	-	~380	-	-	Ta	-	-	Q	RF	2,28@0,58	
Silver Chloride	AgCl	455	-	5.56	-	-	~520	-	-	Mo, Pt	-	Mo	Q	RF	2,13@0,43	
Silver Iodide	AgI	558	-	6.01	-	-	~500	-	-	Ta	-	-	-	RF	2,02@0,59	
Sodium	Na	98	-	0.97	74	124	192	-	-	Ta, SS	-	-	Q	-	0,03@0,59	Preheat gently to outgas. Metal reacts quickly in air.
Sodium Bromide	NaBr	747	-	3.20	-	-	~400	-	-	-	-	-	Q	RF	1,64@0,59	Preheat gently to outgas.
Sodium Chloride	NaCl	801	-	2.17	-	-	530	F	-	Ta, W, Mo	-	-	Q	RF	1,79@0,2	Copper oven. Little decomposition. Preheat gently to outgas. Hygroscopic.
Sodium Cyanide	NaCN	564	-	-	-	-	~550	-	-	Ag	-	-	-	RF	1,45@0,59	Toxic. Preheat gently to outgas.
Sodium Fluoride	NaF	993	-	2.56	-	-	~1000	F	-	Mo, Ta, W	-	-	-	RF	1,3@0,55	Preheat gently to outgas. No decomposition.
Sodium Hydroxide	NaOH	318	-	2.13	-	-	~470	-	-	Pt	-	-	-	-	1,36	Preheat gently to outgas.
Spinel	MgO35Al2O3	-	-	8.0	-	-	-	G	-	-	-	-	-	RF	1,75@0,66	-
Strontium	Sr	769	-	2.6	239	309	403	F	VC	W, Ta, Mo	W	W	VC	RF, DC	0,61@0,58	Toxic. Wets but does not alloy with refractory metals. May react in air.
Strontium Chloride	SrCl2	875	-	3.05	-	-	-	-	-	-	-	-	-	-	-	-
Strontium Fluoride	SrF2	1473	-	4.24	-	-	~1000	-	-	-	-	-	Al2O3	RF	1,44@0,59	-
Strontium Oxide	SrO	2430	S	4.7	-	-	1500	-	-	Mo	-	-	Al2O3	RF	1,88@0,58	Reacts with molybdenum and tungsten.
Strontium Sulfide	SrS	>2000	D	3.70	-	-	-	-	-	Mo	-	-	-	RF	2,11@0,59	-
Sulfur	S8	113		2.07	13	19	57	P	-	W	-	W	Q	-	-	Toxic. Bad for vacuum systems.
Superalloy	Ni/Fe/Mo	1410	-	8.9	-	-	-	G	-	-	-	-	-	RF, DC	-	Sputtering preferred; or co-evaporate from two sources, permalloy and molybdenum.

Material	Symbol	Melting Point (°C)	S/D	density g/cm ³ @20°C	Temp.(°C) for Given Vap. Press. (mBar)			Evaporation Techniques						Sputter	Index of refraction (@µm)	Comments
					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Tantalum	Ta	2996	-	16.6	1960	2240	2590	Ex	Gr	-	-	-	-	DC, RF	2,05@0,58	Forms good films. Traps O2. Sputtering preferred
Tantalum Boride	TaB ₂	3000	-	11.15	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Tantalum Carbide	TaC	3880	-	13.9	-	-	~2500	-	-	-	-	-	-	RF, DC	-	-
Tantalum Nitride	TaN	3360	-	16.30	-	-	-	-	-	-	-	-	-	RF, RF-R, DC	-	Evaporates tantalum in 10 ⁻³ Torr nitrogen.
Tantalum Pentoxide	Ta ₂ O ₅	1872	-	8.2	1550	1780	1920	G	VC	Ta	W	W	VC	RF, RF-R	2,1@0,50	Slight decomposition. Evaporates in 10 ⁻³ Torr oxygen. Films with high dielectric constant
Tantalum Sulfide	TaS ₂	>1300	-	-	-	-	-	-	-	-	-	-	-	RF	-	-
Technetium	Tc	2200	-	11.5	1570	1800	2090	-	-	-	-	-	-	-	-	-
Teflon	PTFE	330	-	2.9	-	-	-	-	-	W	-	-	-	RF	-	Baffled source. Film structure doubtful.
Tellurium	Te	452	-	6.25	157	207	277	P	Gr, VC, Al ₂ O ₃	W	W	W, Ta	Al ₂ O ₃ , Q	RF	4,7@0,55	Toxic. Wets refractory metals without alloying.
Terbium	Tb	1356	-	8.23	800	950	1150	Ex	Al ₂ O ₃	Ta	-	-	Al ₂ O ₃	RF	-	-
Terbium Fluoride	TbF ₃	1172	-	-	-	-	~800	-	-	-	-	-	-	RF	-	-
Thorium	Th	1875	S	11.7	1430	1660	1925	Ex	-	W, Ta, Mo	W	W	-	-	-	Toxic, radioactive. Wets W
Thorium Bromide	ThBr ₄	610	S	5.67	-	-	-	-	-	Mo	-	-	-	-	2,47	Radioactive. Toxic.
Thorium Carbide	ThC ₂	2655	-	8.96	-	-	~2300	-	-	-	-	-	C	RF, DC	-	Radioactive.
Thorium Fluoride	ThF ₄	>900	-	6.32	-	-	~750	F	VC	Ni	-	W	VC	RF	1,52@0,5	Radioactive. Heat substrate to above 150°C.
Thorium Oxide	ThO ₂	3220	-	9.86	-	-	~2100	G	-	W	-	-	-	RF, RF-R	1,8@0,55	Radioactive.
Thorium Oxyfluoride	ThOF ₂	900	-	9.1	-	-	-	-	-	Mo, Ta	-	-	-	-	1,52	Radioactive. Films often ThF ₄ .
Thorium Sulfide	ThS ₂	1925	-	7.30	-	-	-	-	-	-	-	-	-	RF	-	Radioactive. Sputtering preferred or co-evaporate from two sources.

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Thulium	Tm	1545	S	9.32	461	554	680	G	Al2O3	Ta	-	-	Al2O3	DC	-	-
Thulium Oxide	Tm2O3	-	D	8.90	-	-	1500	-	-	Ir	-	-	-	RF	-	-
Tin	Sn	232	-	7.28	682	807	997	Ex	Gr, Al2O3	Mo	W	W	Al2O3	DC, RF	1,48@0,59	Wets molybdenum.
Tin Oxide	SnO ₂	1630	S	6.95	-	-	~1000	Ex	Al2O3	W	W	W	Q, Al ₂ O ₃	RF, RF-R	2,08@0,58	Films from tungsten are oxygen deficient, oxidize in air.
Tin Selenide	SnSe	861	-	6.18	-	-	~400	F	-	-	-	-	Q	RF	-	-
Tin Sulfide	SnS	882	-	5.22	-	-	~450	-	-	-	-	-	Q	RF	-	-
Tin Telluride	SnTe	780	D	6.48	-	-	~450	-	-	-	-	-	Q	RF	-	-
Titanium	Ti	1660	-	4.5	1067	1235	1453	Ex	Gr	Ta	-	-	TiC, VC	DC, RF	2,64@0,58	Alloys with refractory metals; evolves gas on first heating.
Titanium (II) Oxide	TiO	1750	-	4.93	-	-	~1500	G	Gr, VC	W, Ta	-	-	VC	RF	2,4@0,55	Film TiO2 if evaporated like TiO2. Preheat gently to outgas.
Titanium (III) Oxide	Ti2O3	2130	D	4.6	-	-	-	G	-	W	-	-	-	RF	2,3@0,5	-
Titanium (IV) Oxide	TiO2	1830	-	4.26	-	-	~1300	F	-	W	-	W	-	RF, RF-R	2,3@0,5	Suboxide, must be reoxidized to rutile. Tantalum reduces TiO2 to TiO and titanium.
Titanium Boride	TiB2	2900	-	4.50	-	-	-	P	-	-	-	-	-	RF, DC	-	-
Titanium Carbide	TiC	3140	-	4.93	-	-	~2300	-	-	-	-	-	-	RF, DC	-	-
Titanium Nitride	TiN	2930	-	5.22	-	-	-	G	-	Mo	-	-	-	RF, RF-R, DC	-	Sputtering preferred. Decomposes with thermal evaporation.
Tungsten	W	3410	-	19.35	2117	2407	2757	G	-	-	-	-	-	RF, DC	2,76@0,58	Forms volatile oxides. Films hard and adherent.
Tungsten Boride	WB ₂	~2900	-	10.77	-	-	-	P	-	-	-	-	-	RF	-	-
Tungsten Carbide	W ₂ C	2860	-	17.15	1480	1720	2120	Ex	-	C	-	-	-	RF, DC	-	-
Tungsten Disulfide	WS ₂	1250	D	7.5	-	-	-	-	-	-	-	-	-	RF	-	-
Tungsten Oxide	WO ₃	1473	S	7.16	-	-	980	G	-	W, Pt	-	-	-	RF-R	1,7@0,55	Preheat gently to outgas. Tungsten reduces oxide slightly.
Tungsten Selenide	WSe ₂	-	-	9.0	-	-	-	-	-	-	-	-	-	RF	-	-

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Tungsten Silicide	WSi ₂	>900	-	9.4	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Tungsten Telluride	WTe ₃	-	-	9.49	-	-	-	-	-	-	-	-	Q	RF	-	-
Uranium	U	1132	-	19.05	1132	1327	1582	G	-	Mo, W	W	W	-	-	-	Films oxidize. Radioactive
Uranium (II) Sulfide	US	>2000	-	10.87	-	-	-	-	-	-	-	-	-	-	-	-
Uranium (III) Oxide	U ₂ O ₃	1300	D	8.30	-	-	-	-	-	W	-	W	-	RF-R	-	Disproportionates at 1300°C to UO ₂ .
Uranium (IV) Oxide	UO ₂	2878	-	10.96	-	-	-	-	-	W	-	W	-	RF	-	Tantalum causes decomposition.
Uranium (IV) Sulfide	US ₂	>1100	-	7.96	-	-	-	-	-	W	-	-	-	RF	-	Slight decomposition.
Uranium Carbide	UC ₂	2350	D	11.28	-	-	2100	-	-	-	-	-	C	RF	-	-
Uranium Fluoride	UF ₄	960	-	6.70	-	-	300	-	-	Ni	-	-	-	RF	-	-
Uranium Phosphide	UP ₂	-	D	8.57	-	-	1200	-	-	Ta	-	-	-	RF	-	-
Vanadium	V	1890	-	5.96	1162	1332	1547	Ex	-	Mo	-	-	-	DC, RF	3,03@0,58	Wets molybdenum. E-beam-evaporated films preferred. Alloy slightly with W
Vanadium (IV) Oxide	VO ₂	1967	S	4.34	-	-	~575	-	-	-	-	-	-	RF, RF-R	2,51@0,63	Sputtering preferred.
Vanadium (V) Oxide	V ₂ O ₅	690	-	3.36	-	-	~500	-	-	-	-	-	Q	RF	-	-
Vanadium Boride	VB ₂	2400	-	5.10	-	-	-	-	-	-	-	-	-	RF, DC	-	-
Vanadium Carbide	VC	2810	-	5.77	-	-	~1800	-	-	-	-	-	-	RF, DC	-	-
Vanadium Nitride	VN	2320	-	6.13	-	-	-	-	-	-	-	-	-	RF, RF-R, DC	-	-
Vanadium Silicide	VSi ₂	1700	-	4.42	-	-	-	-	-	-	-	-	-	RF	-	-
Ytterbium	Yb	819	-	6.96	247	317	417	G	-	Ta	-	-	-	DC, RF	-	-
Ytterbium Fluoride	YbF ₃	1157	-	-	-	-	~800	-	-	Mo	-	-	-	RF	1,5@0,55	-
Ytterbium Oxide	Yb ₂ O ₃	2346	S	9.17	-	-	~1500	-	-	Ir	-	-	-	RF, RF-R	1,9@0,55	Loses oxygen.
Yttrium	Y	1522	-	4.47	830	973	1157	Ex	Al ₂ O ₃	W, Ta	-	W	Al ₂ O ₃	RF, DC	-	High tantalum solubility.
Yttrium Aluminum Oxide	Y ₃ Al ₅ O ₁₂	1990	-	-	-	-	-	G	-	-	W	-	-	RF	-	Films not ferroelectric.

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Yttrium Fluoride	YF ₃	1387	-	4.01	-	-	-	-		-	-	-	-	RF	1,5@0,55	-
Yttrium Oxide	Y ₂ O ₃	2410	-	5.01	-	-	~2000	G	Gr	W	-	-	Gr	RF, RF-R	1,79@0,589	Loses oxygen, films smooth and clear.
Zinc	Zn	420	-	7.14	127	177	250	Ex	Al ₂ O ₃	Mo, W, Ta	W	W	Al ₂ O ₃ , Q	DC, RF	1,93@0,589	Evaporates well under wide range of conditions. Bad for vacuum systems. Wets refractory metals
Zinc Antimonide	Zn ₃ Sb ₂	570	-	6.33	-	-	-	-	-	-	-	-	-	RF	-	-
Zinc Bromide	ZnBr ₂	394	D	4.20	-	-	~300	-	W	-	-	-	C	RF	1,58@0,58	-
Zinc Fluoride	ZnF ₂	872	-	4.95	-	-	~800	-	-	Pt, Ta	-	-	Q	RF	-	-
Zinc Nitride	Zn ₃ N ₂	-	D	6.22	-	-	-	-	-	Mo	-	-	-	RF	-	-
Zinc Oxide	ZnO	1975	-	5.61	-	-	~1800	F	-	-	-	-	-	RF-R	2@0,55	Anneal in air at 450°C to re oxidize.
Zinc Selenide	ZnSe	>1100	-	5.42	-	-	660	-	-	Ta, W, Mo	W, Mo	W	Q	RF	2,6@0,55	Toxic. Preheat gently to outgas. Evaporates well.
Zinc Sulfide	ZnS	1700	S	3.98	-	-	~800	G	-	Ta, Mo	-	-	Q	RF	2,3@0,55	Preheat gently to outgas. Films partially decompose. Sticking coefficient varies with substrate temperature.
Zinc Telluride	ZnTe	1239	-	6.34	-	-	~600	-	-	Mo, Ta	-	-	-	RF	3,56@0,59	Toxic. Preheat gently to outgas.
Zirconium	Zr	1852	-	6.49	1477	1702	1987	Ex	-	W	-	-	-	RF, DC	-	Flammable. Alloys with tungsten. Films oxidize readily.
Zirconium Boride	ZrB ₂	~3200	-	6.09	-	-	-	G	-	-	-	-	-	RF, DC	-	-
Zirconium Carbide	ZrC	3540	-	6.73	-	-	~2500	-	-	-	-	-	-	RF, DC	-	-
Zirconium Nitride	ZrN	2980	-	7.09	-	-	-	-	-	-	-	-	-	RF, RF-R, DC	-	Reactively evaporates in 10 ⁻³ Torr nitrogen.
Zirconium Oxide	ZrO ₂	~2700	-	5.89	-	-	~2200	G	-	W	-	-	-	RF, RF-R	2,05@0,5	Films oxygen deficient, clear and hard.
Zirconium Silicate	ZrSiO ₄	2550	-	4.56	-	-	-	-	-	-	-	-	-	RF	1,96@0,59	-

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					10-8	10-6	10-4	E-Beam		Thermal Sources						
								Suitability	Liner	Boat	Coil	Basket	Crucible			
Zirconium Silicide	ZrSi ₂	1700	-	4.88	-	-	-	-	-	-	-	-	-	RF, DC		-