Optical Materials for Spectroscopy

Window material	Range From	Range To	Refractive Index at 2000cm^{-1}	General Properties
MgF2	91,000	1,100	1.37	Almost insoluble in water. Hard material suited to relatively high pressure applications. Bi-refringent and subject to thermal shock. Should not be used above 500°C.
LiF	83,000	1,400	1.33	Slightly water soluble. Hard, brittle material. Subject to thermal shock. Should not be used above 400°C.
CaF2	77,000	900	1.40	Insoluble in water, resists most acids and alkalis. Soluble in ammonium salts. Its high mechanical strength makes it particularly useful for high pressure work. Sensitive to mechanical and thermal shock. Does not fog.
BaF2	66,666	800	1.45	Insoluble in water, soluble in acids and NH4Cl. Very sensitive to mechanical and thermal shock. Good resistance to fluorine and fluorides. Does not fog.
NaCl	40,000	600	1.52	Soluble in water and glycerine. Slightly soluble in alcohols. Fair resistance to mechanical and thermal shock and can be easily polished.
AMTIR	11,000	725	2.50	Amorphous Material which Transmits Infrared Radiation. A chalcogenide glass which although relatively hard is brittle. Insoluble in water, resistant to acid but attacked by alkalis.
AgBr	22,000	300	2.30	Insoluble in water, soluble in acids and NH4CL. Very sensitive to mechanical shock and is malleable. Will cold form. Good resistance to thermal shock. Corrosive to metals and alloys. Sensitive to strong UV radiation and will darken with long exposure.
KCl	33,000	400	1.40	Hygroscopic material similar to NaCl but with extended transmission range. Less soluble and lower reflection losses.
KBr	43,500	400	1.54	Hygroscopic material similar to NaCl. Soluble in water, glycerine and alcohols. Slightly soluble in ether. Fairly good resistance to mechanical and thermal shock.
KRS-5	17,000	250	2.38	This material is a mixture of Thallium Bromide and Thallium Iodide salts and is extremely toxic. Orange/red in colour. Slightly soluble in water, soluble in bases, but not soluble in acids. Not hygroscopic. Good transmission range and is ideal for ATR work. Soft, hence easily deformed.
CsBr	42,000	250	1.66	Hygroscopic material. Soluble in water and acids. Soft, hence easily deformed.
CsI	42,000	200	1.74	Extremely hygroscopic material. Soluble in water and alcohols. Useful because of wide transmission range. Mildly toxic.
Silica SiO_2 UV Grade	59,000	3700	1.46	Resistant to acids and alkalis and unaffected by most solvents. Transmission at 50,000cm-1 is 98% for UV grade and 40% for IR grade.
Silica SiO_2 IR Grade	40,000	3000	1.46	Resistant to acids and alkalis and unaffected by most solvents. Transmission at 50,000cm-1 is 98% for UV grade and 40% for IR grade.
ZnS (Cleartran)	50,000	770	2.25	Insoluble in water, normal acids and bases and virtually all organic solvents. Reacts to strong oxidising agents. Good resistance to thermal and mechanical shock. Suitable for work in temperature range -200°C to 800°C.
ZnSe	20,000	500	2.43	Toxic, hard and brittle material. Amber/yellow in colour. Insoluble in water, but attacked by strong acids and bases (pH range 4 to 11 tolerant). Organic solvents have no effect. Ideal for ATR work. Low absorption at 10.6 microns hence popular window material for CO2 lasers.
Ge	5,000	550	4.01	Hard and very brittle material. Is temperature sensitive and loses transmission when heated. Optically opaque at 190°C. Insoluble in water. Soluble in hot sulfuric acid and aqua regia. Suitable for ATR work where high pressure contact is not required.
Diamond	40,000	10	2.40	Very hard and extremely chemically resistant. A diamond window is often chosen for high pressure applications. Excellent for ATR work.
Si	8,333	33	3.42	Very hard, but brittle and relatively inert material. Is attacked by a combination of HF and HNO3. Withstands thermal shock. Useful for Far IR. in the region 400-30cm-1.
Poly-ethylene	625	4	1.52	Inexpensive Far IR window material. Insoluble in water but tends to swell and be contaminated with some organic solvents. Melting point 110°C.