OPTICAL MATERIALS

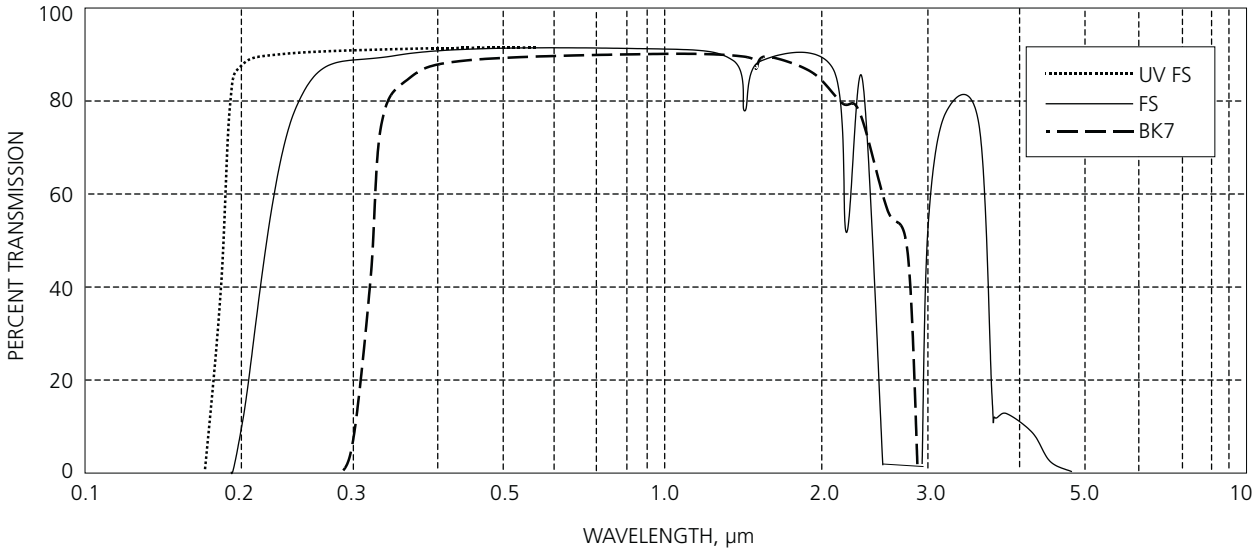
Optical quality fused silica (FS), UV grade fused silica (UV FS) and borosilicate crown glass are the materials used in the majority of EKSMA optical components. EKSMA UV grade FS and borosilicate crown glass used by EKSMA conform the requirements for Shott Glass SUPRASIL and BK7 respectively. EKSMA occasionally uses corresponding glasses made by different glass manufacturers, but only when it does not result in a significant change of optical properties.

Fused silica is an ideal optical material for many applications. It is extremely transparent over a wide spectral range, has a low coefficient of thermal expansion, and is resistant to scratching and thermal shock. When compared with glass or fused quartz, fused silica has a greater UV and IR transmission, wider thermal operating range, much higher resistance to radiation darkening from UV, X-rays and gamma rays. FS components are ideally suited for applications in energy-gathering and imaging systems in the mid-UV, VIS and near-IR spectral ranges. The low dispersion of FS reduces chromatic aberration.

UV grade fused silica offers both highest transmission (especially in deep-UV) and very low fluorescence levels (approximately 0.1% that of fused natural quartz). In deep-UV applications UV grade fused silica is an ideal choice. Its tight index tolerance assures highly predictable lens, window, prism, etc. specifications. Very low bubble content makes it really unique.

BK7 is a material used in a large fraction of EKSMA products. It is relatively hard glass, doesn't scratch easily and can be handled without special precautions. The inclusion and bubble content of BK7 is very low: cross-section totally less than 0.03 mm^2 per 100 cm^3. Another important feature of BK7 is its excellent transmission down to 350 nm. Due to these properties, including inexpensiveness, BK7 is used widely throughout the optics industry.

Some physical properties of these optical materials are presented below.



External transmittance curves of FS, UV FS and BK7 glass samples, 10 mm thickness, uncoated.

Physical Constants

Optical material		UV FS	FS	BK7
Abbe constant		67.84	67.84	64.07
Density (g/cm^3)		2.21	2.21	2.52
Coefficient of linear thermal expansion from +20 to +120°C (1/°C)		5.2×10^{-7}	5.2×10^{-7}	7.6×10^{-6}
Thermal conductivity (50°C, cal/g°C)		0.122	0.122	0.180
Constants of dispersion formula: $n^2=A_0+A_1\lambda^2+A_2\lambda^{-2}+A_3\lambda^{-4}+A_4\lambda^{-6}+A_5\lambda^{-8}$ *in range from 365 nm to 1064 nm*	A_0	2.1026513	2.1026513	2.2699804
	A_1	-8.5943075×10^{-3}	-8.5943075×10^{-3}	-9.8250605×10^{-3}
	A_2	9.8576238×10^{-3}	9.8576238×10^{-3}	1.1017203×10^{-2}
	A_3	-2.4538022×10^{-4}	-2.4538022×10^{-4}	7.6606834×10^{-5}
	A_4	4.4589827×10^{-5}	4.4589827×10^{-5}	1.1616952×10^{-5}
	A_5	-1.9692608×10^{-6}	-1.9692608×10^{-6}	5.8130900×10^{-7}
Young's modules (dynes/mm^2)		7.43×10^{9}	7.43×10^{9}	8.23×10^{9}
Index of refraction at wavelength, nm:	365.0	1.474539	1.474539	1.53582
	404.66	1.469618	1.469618	1.52982
	435.83	1.466623	1.466623	1.526266
	479.99	1.463473	1.463473	1.522408
	486.13	1.463137	1.463137	1.521955
	546.07	1.460078	1.460078	1.518294
	587.56	1.458464	1.458464	1.516373
	589.29	1.458464	1.458464	1.516300
	643.85	1.456707	1.456707	1.514292
	656.27	1.456367	1.456367	1.513895
	706.52	1.455145	1.455145	1.51246
	768.2	1.45389	1.45389	1.51100
	852.1	1.452465	1.452465	1.50937
	1013.9	1.450242	1.450242	1.50687
	1128.6	1.448869	1.448869	1.50536
	1395.1	1.44584	1.44584	1.50210
	1529.6	1.44427	1.44427	1.50045
	1813.1	1.44070	1.44070	1.49674
	1970.1	1.43852	1.43852	1.49449

Other optical materials e.g. analogues to Shott Glass BaK1, Shott SF11, Shott SF5, IR grade FS, water free FS, etc. are available on customer's request.