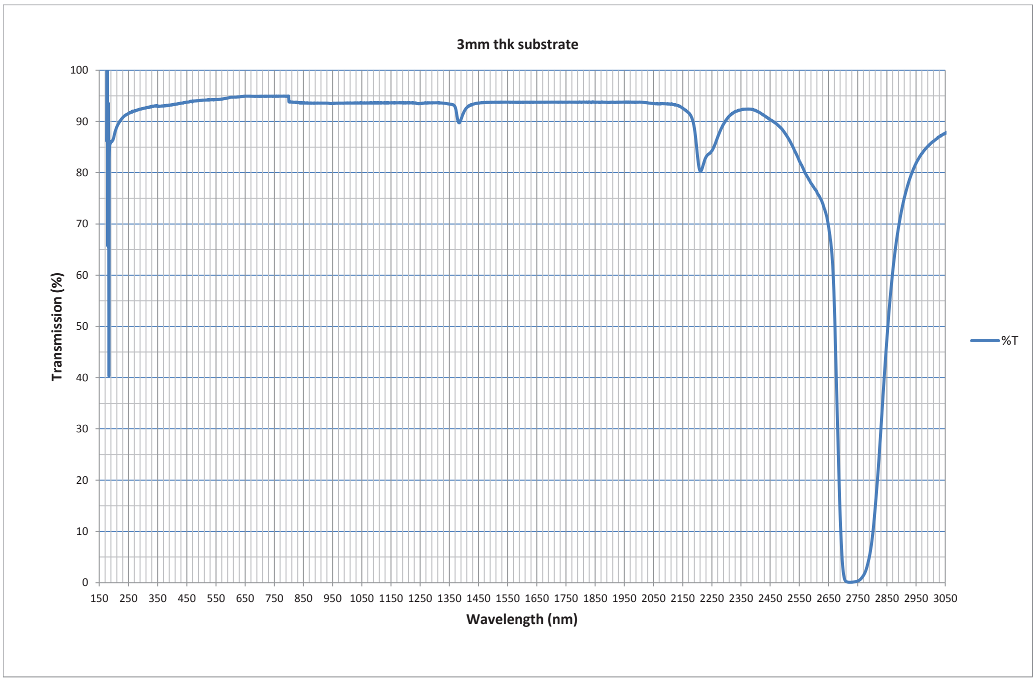
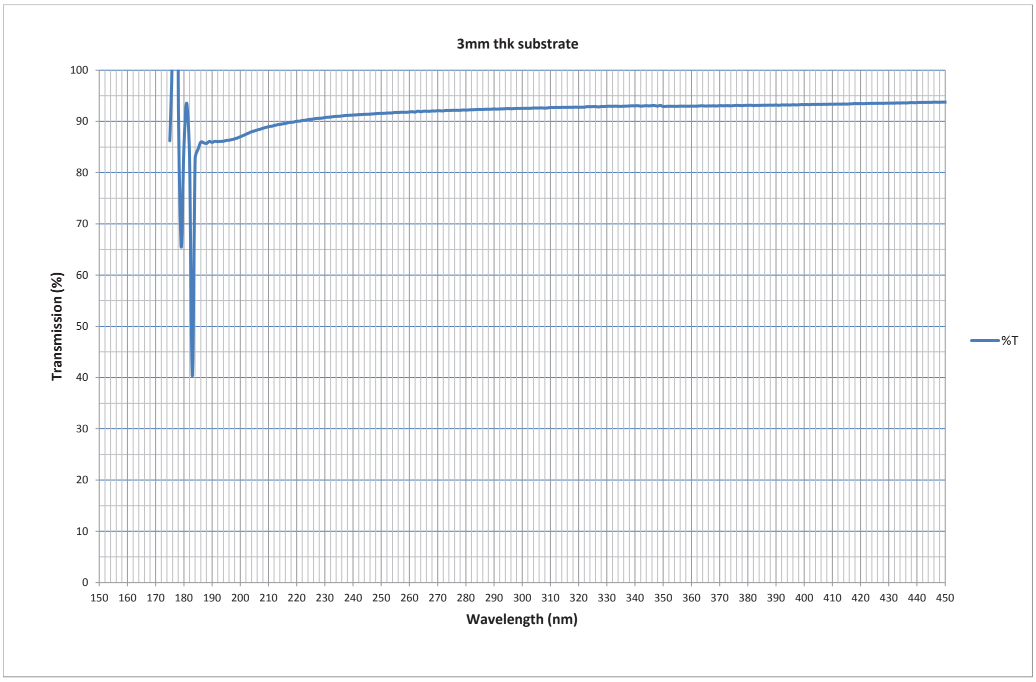
OPTICAL MATERIALS : ULTRA-VIOLET

Title: Optical material/ crystals (Ultraviolet)

Material/Specification: UV grade fused silica, Spectrosil 2000 2G for 170-2500nm transmission

Range/Description: OPMU-SPEC2000





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OPTICAL MATERIALS : ULTRA-VIOLET

Spectrosil® synthetic fused silica is manufactured using a patented, environmentally friendly process resulting in a chlorine-free material of exceptional purity and excellent visual quality, which is free of bubbles and inclusions. (Bubble class 0 - DIN 58927)

Spectrosil® is available in a range of grades for use in a wide variety of optical and fibre optic applications, including specially developed **2200 - ArF** and **2200 - KrF** excimer laser grades, which are optimised for use in microlithography and other critical deep UV optical systems.

Spectrosil® 2000 and **2200** are both fluorescence-free and due to their ultra-high purity have excellent optical transmission, with a useful range from below 180 nm in the deep UV through to 2 000 nm in the infrared.

Available Forms

Ingot — Spectrosil® 2000 is available in the form of round ingots in a range of diameters and lengths.

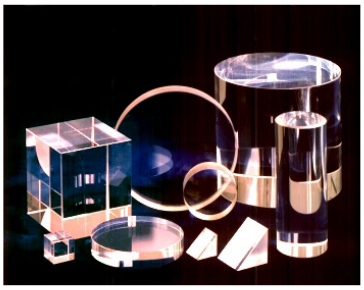
Blanks/Components — Spectrosil® 2000 and 2200 are available as Discs, Plates, Blocks, Core-drilled rods and other shapes with a machined or polished surface finish.

Re-drawn Rod — Spectrosil® 2000 is available as re-drawn rod in a range of diameters. **F Grade** rod is specially prepared for the manufacture of optical fibres and **R Grade** is for non-fibre applications. Spectrosil® 1000 is only available as **R Grade** re-drawn rod.

Optical Properties

Spectrosil® Grade	1000 R Grade Rod	2000	2000 F & R Grade Rod	2200 ArF & KrF Grades
Available Forms	Re-drawn Rod	Ingot Cored Rod Blank Component	Re-drawn Rod	Cored Rod Blank Component
Bubbles Bubble class (DIN 58927)	0	0	0	0
Maximum number of inclusions	0	0	0	0
Striae (MIL-G-174A)	Not specified	3 Directions Free	1 Direction Free	3 Directions Free
Granularity	None	None	None	None
Refractive index homogeneity		†		†
Up to 250 mm diameter	Not specified	$< 10 \times 10^{-6}$	Not specified	$< 5 \times 10^{-6}$
Over 250 mm diameter	Not specified	†	Not specified	$< 10 \times 10^{-6}$
Birefringence / Residual strain† (nm/cm – over 95% of diameter of machined component only)	Not specified	< 10	Not specified	< 5
Fluorescence (254 nm excitation)	Not specified	None	None	None
Typical standard diameters†	50 mm	350 mm	50 mm	250 mm

† Please enquire for Spectrosil® 2000 & 2200 material with improved Refractive index homogeneity, lower birefringence/residual strain and/or larger size than shown above



- **Spectrosil® 2200 - ArF**
  Spectrosil® 2200 - KrF
  These grades have been specially developed and are manufactured under specific conditions to ensure maximum transmission and prolonged life in ArF (193 nm) and KrF (248 nm) lithography systems and other critical deep UV excimer laser applications
- **Spectrosil® 2000**
  is a deep UV, bubble-free and fluorescence-free optical grade that is available as a standard grade as shown in the table on the left. For more critical applications it can also be specified with improved homogeneity and birefringence/residual strain
- **Spectrosil® 1000**
  is available only as re-drawn rod in a range of diameters and lengths

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Typical Internal Transmission
(10 mm pathlength)

	λ = 193.4 nm	λ = 248 nm
Spectrosil® 2200 – ArF Grade	> 99.5 %	–
Spectrosil® 2200 – KrF Grade	–	> 99.9 %
Spectrosil® 2000	> 99 %	> 99.5 %
Spectrosil® 1000	Not specified	Not specified

Typical Chemical Analysis

	Spectrosil® 1000	Spectrosil® 2000/2200
	Typical trace elements in ppb	
Al	<20	<10
Ca	<10	<10
Co	<10	<10
Cr	<10	<10
Cu	<10	<10
Fe	<10	<10
K	<10	<10
Li	<10	<10
Mg	<10	<10
Mn	<10	<10
Na	<10	<10
Ti	<10	<10
V	<10	<10
Zn	<10	<10
Zr	<10	<10
	ppm	
Cl	<1	<1
OH	1000	1000

Basic Polishing Specification

Plate Glass Finish (PGF)

Where the ratio of diameter to thickness (or diagonal to thickness) does not exceed 20:1 the standard specification is:

Parallelism: 5 minutes of arc
Flatness: 1λ at 589 nm
Scratch-dig: 60-40

Please enquire if an improved polishing specification is required

Thermal Data

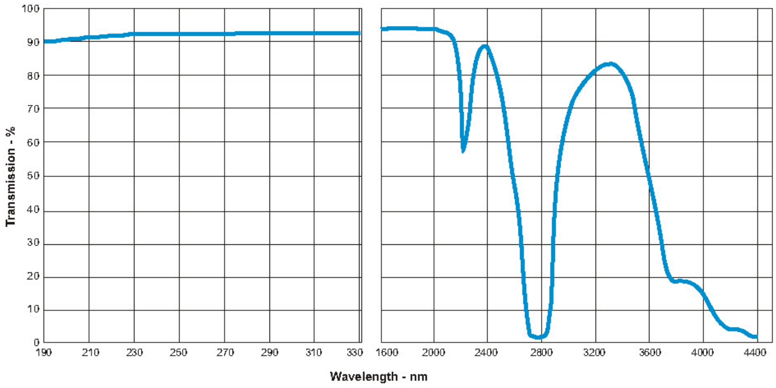
Strain Point: † 950°C
Annealing Point: † 1100°C
Softening Point: † 1710°C

Thermal Expansion Coefficient: (Average) 0.54×10^{-6}

† Note that these values may vary, depending on the thermal history of the glass

Transmission

Typical external transmission of Spectrosil® 2000/2200 fused silica
(including Fresnel reflection losses for 10 mm pathlength)



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