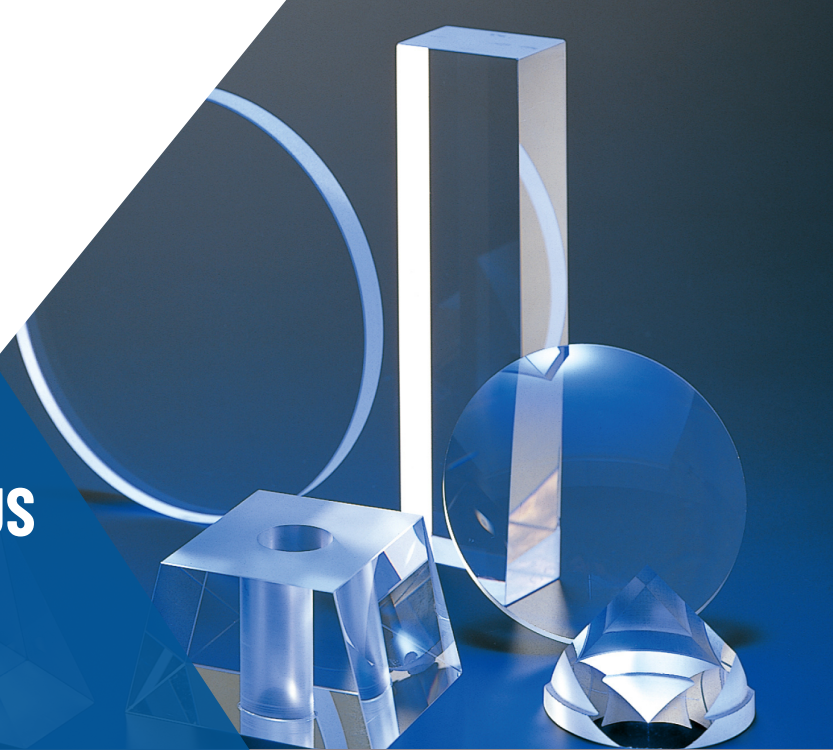


The Future Made Clear



VAD-PROCESS ANHYDROUS SYNTHETIC FUSED SILICA SK-1300



SK-1300 Fused Silica

OHARA successfully developed synthetic fused silica SK-1300 as a result of significant improvements made to the conventional VAD (vapor-phase axial deposition) method of optical fiber manufacturing technology. SK-1300 is extremely high in purity and much lower in OH content thus making it the first synthetic fused silica usable in the semiconductor and liquid crystal display industries. SK-1300 is state-of-the-art in optical characteristics because it provides a high UV transmission, no micro inclusions, and solarization resistance, in addition to heat resistance, mechanical strength, and chemical resistance. These products can be used in a wide variety of industrial applications for semiconductors, optical and all physical or chemical related research featuring these applications:

1. Various devices such as TFT (poly-Si thin-film transistor LCD) and SOI (Silicon on Insulator).
2. Photomask substrates for ultra-LSI and LCD.
3. Reactor furnace tubes, jigs and tools for ULSI manufacturing processes.
4. Electrical-discharge lamp tubes.
5. Optical elements, lenses, mirrors, and windows for UV and vacuum UV.

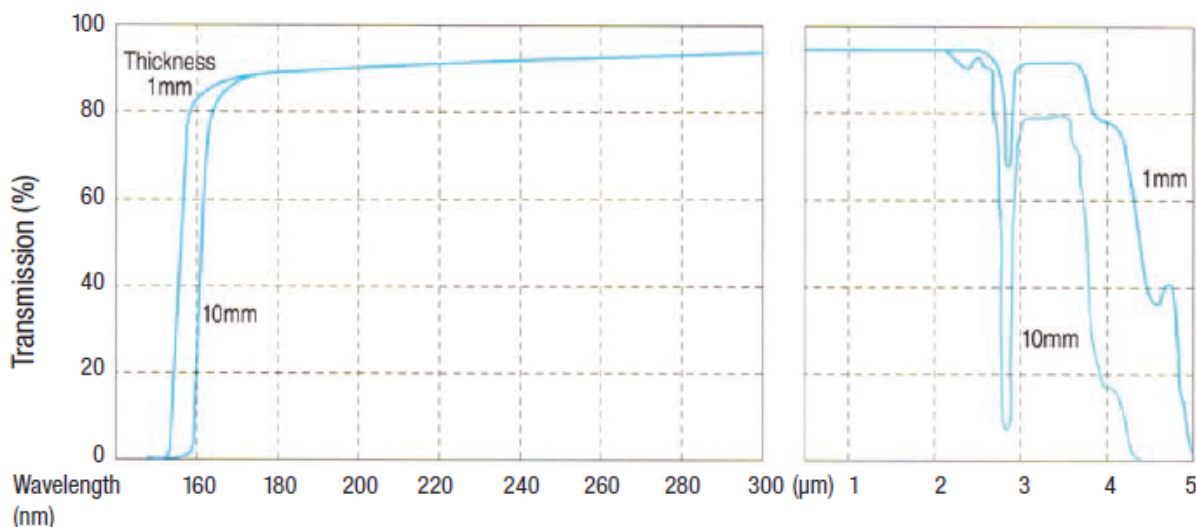
		Element	Analytical Value	Element	Analytical Value
Typical Impurity Analysis	ppb	Al	<0.2	Co	<0.01
		Fe	<0.5	Ni	<1.0
		Ti	<0.1	P	<1.0
		Ca	<0.5	B	<0.01
		Mg	<0.1	Na	<0.5
		Mn	<0.1	K	<0.2
		Cr	<0.2	Li	<0.1
		Cu	<0.2	Zr	<0.1
				OH	<200 (ppm)

	Solution	Treatment Temperatures (°C)	Hours (H)	Weight Loss (mg/cm ²)
Chemical Resistance	H ₂ O	95	45	0.0001~0.0002
	1/100 N HNO ₃	115	24	0.005~0.01
	5% NaOH	100	10	1.35

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Transmission



	Wavelength (nm, in air)	25°C in air	Wavelength (nm, in air)	20-5°C in air dn/dT
Refractive Index	365.015(i)	1.47465	1013.98(t)	9.6
	404.656(h)	1.46972	643.85(C')	9.8
	435.835(g)	1.46680	632.80(He-Ne)	10.0
	486.133(F)	1.46323	589.29(D)	10.0
	546.075(e)	1.46018	546.07(e)	10.1
	587.562(d)	1.45857	479.99(F')	10.4
	656.273(C)	1.45647	435.835(g)	10.6
	Measuring accuracy $\pm 1 \times 10^{-6}$		Measuring accuracy $\pm 1 \times 10^{-6}$	

Item	Grade
Optical Qualities	
Bubbles	0~0.03mm ² /100cm ³
Striae	Grade A in one direction (As per Mil-G-174)
Birefringence (Strain)	10nm/cm and under
Fluorescence	Not permitted (Excited wavelength 254nm)

Item	Unit	Value	Item	Unit	Value
Physical Properties					
Density	g/cm ³	2.201	Coefficient of thermal expansion	cm/cm°C	5.5x10 ⁻⁷
Young's module	10 ⁸ N/m ²	724			
Poisson's ratio		0.17	Softening point	°C	1600
Compression strength	kg/mm ²	115	Annealing point	°C	1160
Bending strength	kg/mm ²	7.0	Strain point	°C	1060
Tensile strength	kg/mm ²	5.6			
Torsional rigidity	kg/mm ²	3150	Specific heat (26°C)	cal/g • °C	0.176
Vickers hardness	kg/mm ²	900~1030	(26°C) cal/cm • sec • °C		2.65x10 ⁻³
Knoop hardness	kg/mm ²	650~710	Thermal conductivity ratio		
			(100°C) cal/cm • sec • °C		3.27x10 ⁻³

Please contact us to discuss your specific requirements.

GET IN TOUCH

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SK-1300 Series Glass Data Sheet

Code(d) **459678**

Code(e) **460677**

Refractive Index n_d	1.45857 1.458567	Abbe Number v_d	67.8 67.84	Dispersion n_F-n_C	0.00676 0.006760
Refractive Index n_e	1.460181	Abbe Number v_e	67.68	Dispersion $n_F-n_{C'}$	0.006799

Refractive Indices(at 25°C,Air,1013hPa)		
$\lambda(\mu\text{m})$		
n_{2325}	2.32542	1.43307
n_{1970}	1.97009	1.43864
n_{1530}	1.52958	1.44438
n_{1129}	1.12864	1.44898
n_t	1.01398	1.45035
n_s	0.85211	1.45257
$n_{A'}$	0.76819	1.45399
n_r	0.70652	1.45525
n_C	0.65627	1.45647
$n_{C'}$	0.64385	1.45681
$n_{\text{He-Ne}}$	0.63280	1.45712
n_D	0.58929	1.45851
n_d	0.58756	1.45857
n_e	0.54607	1.46018
n_F	0.48613	1.46323
$n_{F'}$	0.47999	1.46361
$n_{\text{He-Cd}}$	0.44157	1.46633
n_g	0.435835	1.46680
n_h	0.404656	1.46972
n_i	0.365015	1.47465
n_{KrF^*}	0.24850	1.50840
n_{ArF^*}	0.19330	1.56041

Partial Dispersions	
n_C-n_t	0.006122
$n_C-n_{A'}$	0.002478
n_d-n_C	0.002097
n_e-n_C	0.003711
n_g-n_d	0.008230
n_g-n_F	0.003567
n_h-n_g	0.002925
n_i-n_g	0.007850
n_C-n_t	0.006459
$n_e-n_{C'}$	0.003374
$n_{F'}-n_e$	0.003425
$n_i-n_{F'}$	0.011041

Relative Partial Dispersions	
$\theta_{C,t}$	0.9056
$\theta_{C,A'}$	0.3666
$\theta_{d,C}$	0.3102
$\theta_{e,C}$	0.5490
$\theta_{g,d}$	1.2175
$\theta_{g,F}$	0.5277
$\theta_{h,g}$	0.4327
$\theta_{i,g}$	1.1612
$\theta'_{C,t}$	0.9500
$\theta'_{e,C'}$	0.4962
$\theta'_{F',e}$	0.5038
$\theta'_{i,F}$	1.6239

Thermal Properties	
Strain Point StP (°C)	1060
Annealing Point AP (°C)	1160
Softening Point SP (°C)	1600
Expansion Coefficients (+0~+200°C)	5.5
α (10 ⁻⁷ /°C) (+100~+300°C)	-
Thermal Conductivity k (W/m·K)	1.3
Specific heat capacity c (J/kg·K)	734
Thermal diffusivity (10 ⁻⁷ m ² /s)	8.05

Coloring			
λ_{80}	~165	λ_5	~165
λ_{70}	~165		

~165:Less than 165nm

Internal Transmittance	
$\lambda(\text{nm})$	$\tau_{10\text{mm}}$
172*	0.983
193*	0.997
248*	0.999~
250	0.999~
260	0.999~
270	0.999~
280	0.999~
290	0.999~
300	0.999~
320	0.999~
340	0.999~
360	0.999~
365*	0.999~
380	0.999~
400	0.999~
450	0.999~
500	0.999~
550	0.999~
587*	0.999~
600	0.999~
650	0.999~
700	0.999~
800	0.999~
900	0.999~
1000	0.999~
1129*	0.999~
1200	0.999~
1400	0.998
1530*	0.999~
1600	0.999~
1800	0.999~
1970*	0.999~
2000	0.999~
2326*	0.994
2400	0.991
2500	0.982

Deviation of Relative Dispersions $\Delta\theta$ from "Normal"	
$\Delta\theta_{C,t}$	0.0406
$\Delta\theta_{C,A'}$	0.0085
$\Delta\theta_{g,d}$	-0.0063
$\Delta\theta_{g,F}$	-0.0040
$\Delta\theta_{i,g}$	0.0042

Mechanical Properties	
Young's Modulus E (10 ⁸ N/m ²)	724
Rigiditv Modulus G (10 ⁸ N/m ²)	309
Poisson's Ratio σ	0.17
Knoop Hardness Hk[Class]	650 7
Abrasion Aa	-
Photoelastic Constant β (nm/cm/10 ⁵ Pa)	3.5

Constants of Dispersion Formula	
A_1	7.92122197E-01
A_2	3.12281689E-01
A_3	9.14368121E-01
B_1	5.26428733E-03
B_2	1.47301780E-02
B_3	9.98720100E+01

Chemical Properties	
Water Resistance(Powder) Group RW(P)	1
Acid Resistance(Powder) Group RA(P)	1
Weathering Resistance(Surface) Group W(S)	-
Acid Resistance(Surface) Group SR	1
Phosphate Resistance PR	-

Other Properties	
Bubble Quality Group	1
Specific Gravity	2.20
Remarks	

Electrical Properties	
Dielectric constant ϵ	4.0
Dielectric tangent $\tan\delta$	0.0004
Volume resistivity($\Omega\cdot\text{cm}$)	>1E+16

Impurities	
OH content (ppm)	<200
Cl content (ppm)	<1

Temperature Coefficients of Refractive Index							
Range of Temperature (°C)	dn/dt relative (10 ⁻⁶ /°C)						
	t	C'	He-Ne	D	e	F'	g
-40~0	-	-	-	-	-	-	-
0~20	-	-	-	-	-	-	-
20~25	9.6	9.8	10.0	10.0	10.1	10.4	10.6
20~40	-	-	-	-	-	-	-
40~60	-	-	-	-	-	-	-

0.999~:better than 0.999

*Precision Measurements

Rev.F DATE 2018/10/24