



## VIOSIL SQ

### SILICE FONDUE HAUT DE GAMME (QUARTZ SYNTHÉTIQUE)

#### Description

VIOSIL SQ produced by ShinEtsu in Japan is a highly transparent and highly pure synthetic silica glass. It shows excellent optical properties such as the absence of bubbles or inclusions. It is ideally used for photomask substrates and can be produced with a maximum size of approx. 1300x1500mm in different heavier wall thicknesses. There is also another grade available which is called Viosil SX. GVB mainly treats and stores material from Viosil SQ, so this data sheet mainly focuses on this material grade.



#### Special properties of VIOSIL SQ

- **Transmissivity:** High transmissivity to deep UV — ideal for example for UV nano-imprints. The material is suitable for a wide transmission range from UV to IR
- **UV-resistance:** UV-resistance has been established from extensive use in photomask substrates.
- **Chemical resistance:** high stability against a variety of solvents.
- **Low Thermal Expansion:** Synthetic Quartz offers a high stability when exposed to temperature variations.
- **High heat-resistance and mechanical strength:** high dimensional stability over a wide temperature range
- **Excellent surface quality:** high flatness and uniformity of thickness, low surface roughness averages
- **Dielectric properties:** low dielectric loss at GHz frequencies
- **Fluorescence:** no fluorescence over a wide range of wavelengths from UV to IR



## Typical applications

- protective windows for laser applications
- photomask substrates
- general optical applications
- optical items like lenses and prisms
- mirror substrates
- substrates for optical coatings

## PROPERTIES OF VIOSIL SQ

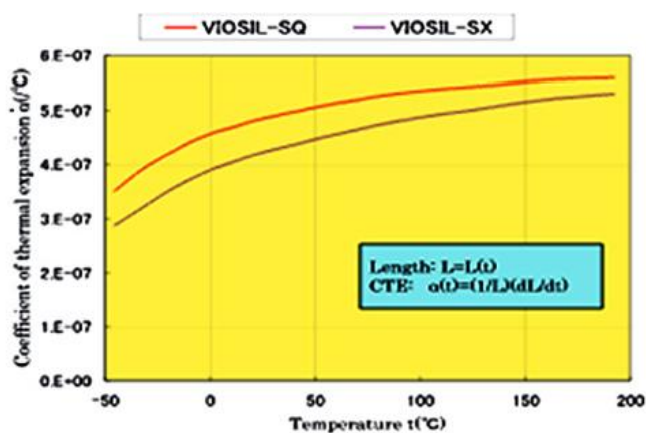
### Chemical Composition (Impurities/ppb) OH-

content: 1200ppm

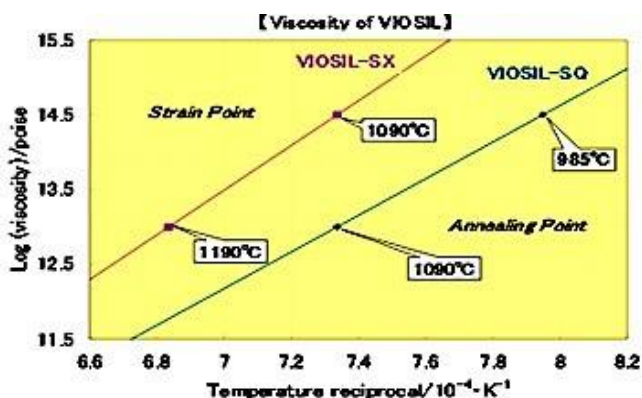
Li	Na	Mg	Al	Ca	Ti	V	Cr	K
<1	<1	<1	<1	<1	<1	<1	<1	<1
Mn	Fe	Co	Ni	Cu	Zn	Ge	Zr	Mo
<1	<1	<1	<1	<1	<1	<1	<1	<1
Cd	Sn	Sb	Pb	B	P	U	As	SiO <sub>2</sub>
<1	<1	<1	<1	<1	<1	<0.1	<0.1	99.99%

## Thermal Properties

### Thermal Expansion



### Heat Resistance



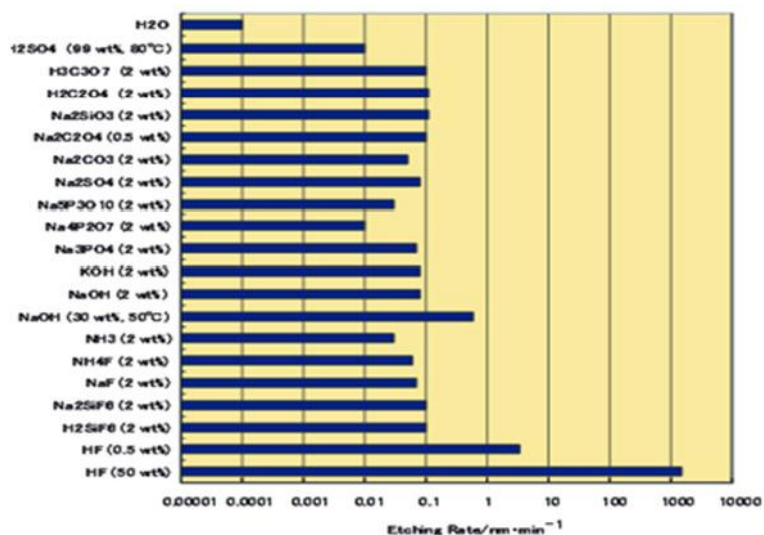


## Mechanical Properties

Specific gravity	2.202 g/cm <sup>2</sup>
Young's Modulus	7380 kgw/mm <sup>2</sup>
Poisson's Ratio	0.17
Vicker's hardness (Hv)	784 kgw/mm <sup>2</sup>
Shear modulus (G)	3150 kgw/mm <sup>2</sup>

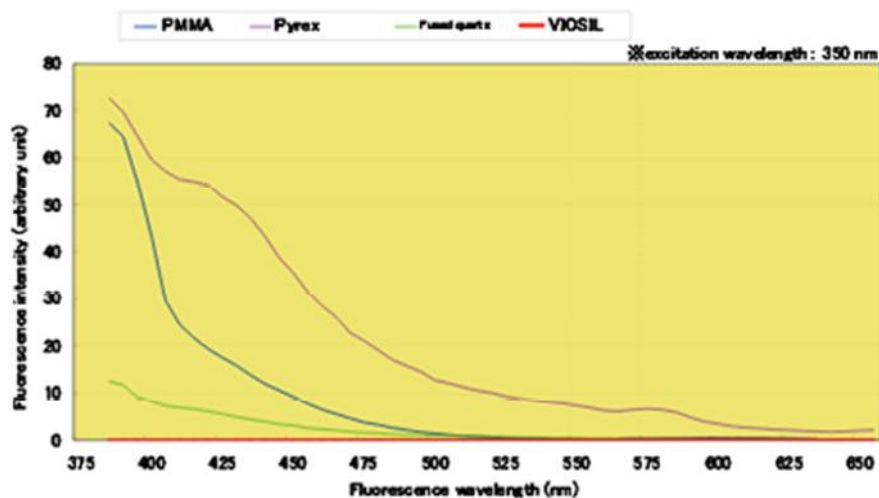
## Chemical Properties

### Chemical Durability



## Optical Properties

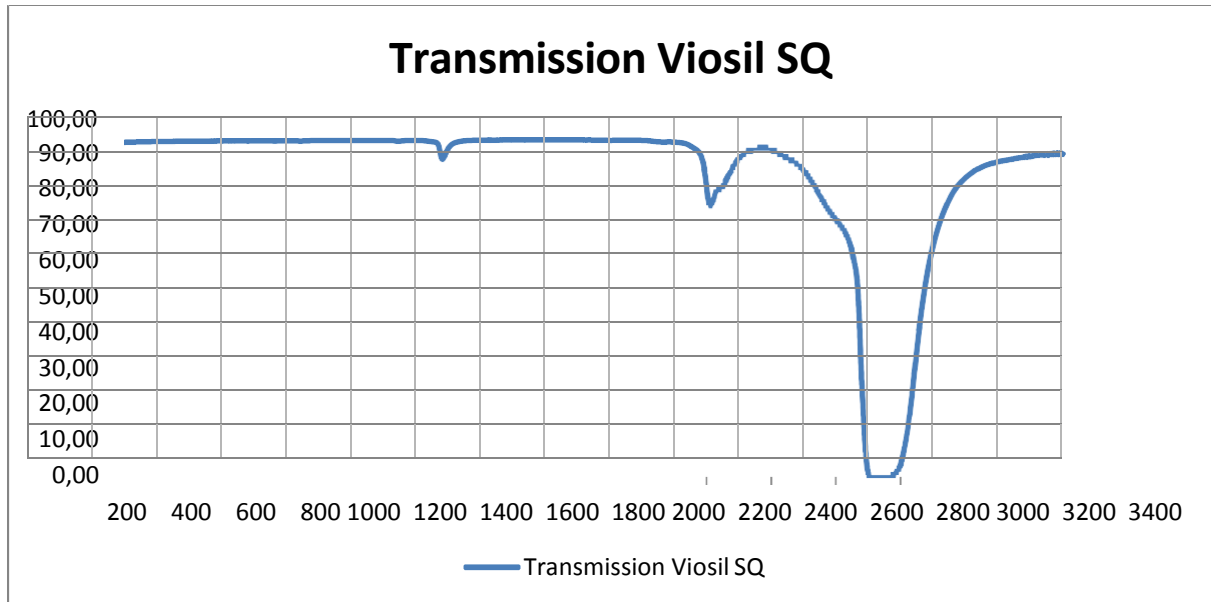
### Fluorescent Intensity





Refractive Index:	1.461 (532nm) 1.449 (1064nm)
Absorption coefficient: Expansion Coefficient	<4x10 <sup>4</sup> 5.5x10 <sup>-7</sup>

## Optical Transmission in the VIS



Measured thickness is 2.3mm



## Visual light transmission in numbers

X-Y

Data Interval 5.00

(nm)	%T	(nm)	%T	(nm)	%T
799.9	93.331	599.9	93.269	399.9	92.845
794.9	93.017	594.9	93.067	394.9	92.780
789.9	93.197	589.9	93.097	389.9	92.775
784.9	93.532	584.9	93.077	384.9	92.615
779.9	93.017	579.9	93.127	379.9	92.713
774.9	93.291	574.9	93.230	374.9	92.737
769.9	92.473	569.9	93.290	369.9	92.733
764.9	93.387	564.9	93.066	364.9	92.338
759.9	93.222	559.9	92.999	359.9	92.580
754.9	93.007	554.9	92.994	354.9	92.487
749.9	93.271	549.9	93.146	349.9	92.552
744.9	93.210	544.9	92.981	344.9	92.259
739.9	92.911	539.9	93.216	339.9	92.436
734.9	93.534	534.9	93.149	334.9	92.452
729.9	93.343	529.9	93.107	329.9	92.375
724.9	93.301	524.9	93.032	324.9	92.221
719.9	93.274	519.9	93.041	319.9	92.341
714.9	93.309	514.9	93.104	314.9	92.180
709.9	93.351	509.9	93.152	309.9	92.162
704.9	93.127	504.9	92.873	304.9	91.983
699.9	93.435	499.9	92.881	299.9	92.052
694.9	93.026	494.9	92.981	294.9	91.997
689.9	93.662	489.9	93.019	289.9	91.791
684.9	92.930	484.9	93.019	284.9	91.752
679.9	93.270	479.9	92.932	279.9	91.722
674.9	93.310	474.9	93.099	274.9	91.636
669.9	93.591	469.9	93.015	269.9	91.655
664.9	92.975	464.9	92.791	264.9	91.354
659.9	92.832	459.9	92.890	259.9	91.435
654.9	93.327	454.9	92.959	254.9	91.393
649.9	92.980	449.9	92.790	249.9	91.304
644.9	92.733	444.9	92.829	244.9	91.136
639.9	93.039	439.9	92.836	239.9	90.933
634.9	93.409	434.9	92.865	234.9	90.977
629.9	93.008	429.9	92.917	229.9	90.797
624.9	93.123	424.9	92.864	224.9	90.548
619.9	93.110	419.9	92.851	219.9	90.607
614.9	93.152	414.9	92.885	214.9	90.253
609.9	93.430	409.9	92.996	209.9	89.943



## Electrical Properties

Dielectric Constant (20 °C)	3.9 (1 MHz); 3.9 (100 MHz) 3.9 (30 GHz); 3.9 (60 GHz)
Doelectric loss	<math>1 \times 10^{-4}</math> (1 MHz); <math>1 \times 10^{-4}</math> (100 MHz) <math>4 \times 10^{-4}</math> (30 GHz); <math>7 \times 10^{-4}</math> (60 GHz)

## Inclusion (including bubble)

Unit: mm

Material	$\varnothing \leq 0.1$	$\varnothing \leq 0.3$	$\varnothing \leq 0.5$	$\varnothing \leq 0.7$	$\varnothing \leq 1.3$	$\varnothing \leq 2.0$
			total inclusion of mm <sup>2</sup> per cross section of 100x100mm			
Viosil SQ	≤ 0.03	≤ 0.01	≤ 0.25	≤ 0.5	0	0

## Treatment and cleaning of Optical Glass

A thorough and appropriate cleaning and treatment of optical glass products is essential to maintain the properties. The following recommendations should be noticed:

### Our recommendations for cleaning

- Do not clean parts of quartz glass with alkali detergents.
- Contaminations with fat can be removed with alcohol.
- Acids in 5 % hydrofluoric acids for 2-3 minutes.
- Subsequent cleaning in distilled or deionised water.
- After cleaning, touch the quartz glass only with clean gloves.
- If possible, process quartz glass only after cleaning or pack it carefully.

Quartz glass should be touched only with gloves. You should also take care that the rooms, tools and machines meet high cleanness demands.