HSQ® 400

Stabilized Electrically Fused Quartz Glass

With HSQ® 400, the maximum working temperature of fused quartz furnace tubes can be extended well past the point where the material would normally deform under its own weight. HSQ® 400 takes advantage of the ability of quartz glass to revert to a crystalline state under the right conditions. Stabilization is achieved by inducing a thin uniform layer of cristobalite on the outer tube surface upon its first exposure to elevated temperature.

Characteristics

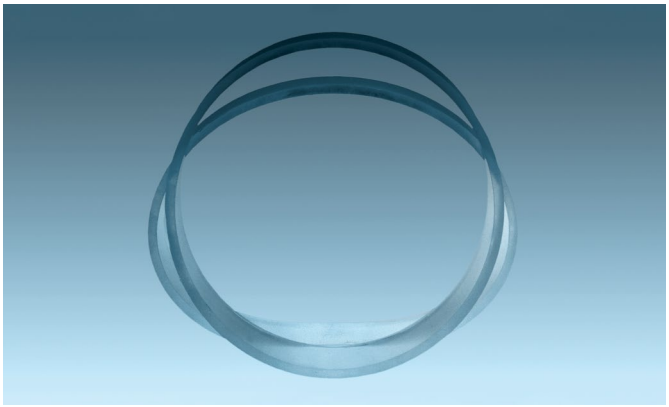
HSQ® 400 offers in addition to the properties of standard fused quartz – high purity and low bubble content – the advantage of longer lifetime at high temperatures. Dimensional and mechanical characteristics are similar to HSQ® 300.

High viscosity electrically fused quartz glass is the standard base material to which the HSQ® 400 treatment is applied.

HSQ® 400 tubes behave as standard electrically fused quartz in glass forming processes such as splicing, welding, shaping and annealing. But please consider that the stabilized layer is thin. HF exposure should be limited to 5 min in 5 % HF.

Conditioning

The formation of the cristobalite layer is a consequence of a special preparation of the outer surface. By carefully heating the tube, a thin crystalline (cristobalite) shell is formed that physically supports the tube cross-section.

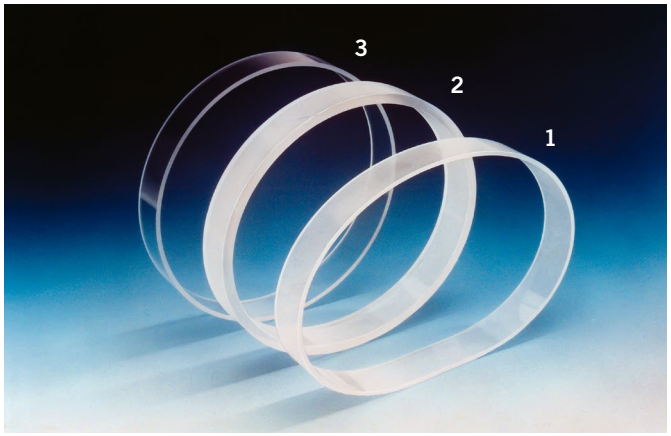


The crystal formation starts immediately when the tube is exposed to a temperature of 1150 °C or above. Because the nucleating agent is a material that has an extremely low ability to diffuse in fused quartz, there is no risk of contamination of the inner surface of the process tube.

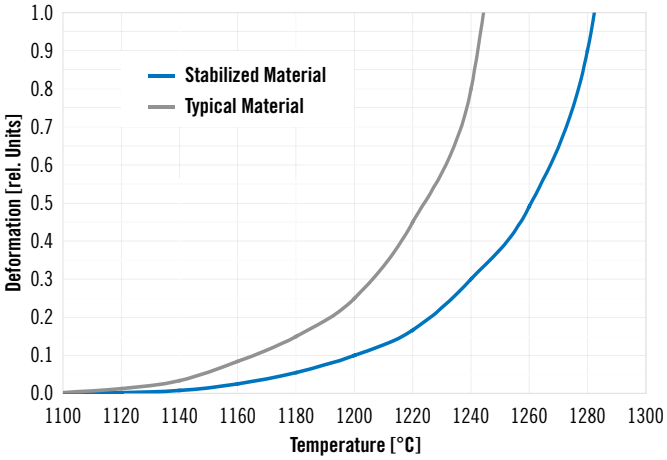
The conditioning process for a stabilized tube is as follows:
The tube should be exposed to a temperature above 1150 °C for several hours in order to promote proper formation of the cristobalite layer. The cristobalite layer will slowly increase in thickness thus greatly enhancing the mechanical stability of the process tube.

It is very important that the tube is not cooled below 300 °C once it has been conditioned. Below 300 °C cristobalite will undergo a phase transformation resulting in cracking of the stabilization layer and consequently reduced thermal stability.

Thermal Stability



Sagging tests performed at a high temperature for 18 hours demonstrate the superior performance of HSQ® 400 tubes compared to standard electrically fused quartz tubes. The picture shows a ring section (1) which has not been stabilized compared to an HSQ® 400 ring section (2) exposed to an elevated temperature >1150 °C for several hours. The last ring section (3) shows the shape prior to testing.



Product Range

Stabilized Tubes	
Outer diameter	55–600 mm
Wall thickness	2–13 mm (depending on tube diameter)

Chemical Properties (Typical Values)

Trace Element Concentration (ppm)

	Li	Na	K	Mg	Ca	Fe	Cu	Cr	Ni	Mn	Ti	Zr	Al	OH
HSQ® 400	0.5	0.2	0.3	< 0.03	0.5	0.1	0.01	< 0.01	< 0.01	< 0.03	1.1	1.0	15	< 30*

*OH content can be reduced by additional annealing.

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Germany
Heraeus Quarzglas GmbH & Co. KG
Heraeus Conamic
Kleinostheim, Germany
Phone: +49 6181 35-7444
conamic.basematerials.eu@heraeus.com

USA
Heraeus Quartz North America, LLC.
Heraeus Conamic
Chandler, Arizona, USA
Phone: +1 480 233-1907
conamic.basematerials.us@heraeus.com

UK
Heraeus Conamic UK Ltd.
Wallsend, UK
Phone: +44 191 2598-411
conamic.basematerials.eu@heraeus.com

Korea
Heraeus Korea Corporation
Heraeus Conamic Anseong Factory
Miyang-myeon, Gyeonggi-do, Korea
Phone: +82 31 671-7601
conamic.basematerials.kr@heraeus.com

China
Heraeus ShinEtsu Quartz (China) Inc.
Pudong, Shanghai, China
Phone: +86 21 6867 2266-809
conamic.basematerials.cn@heraeus.com

Japan
Shin-Etsu Quartz Products Co., Ltd.
Shinjuku, Tokyo, Japan
Phone: +81 3 3348-1913
division3@sqp.co.jp

Taiwan
Heraeus Materials Technology Taiwan Ltd.
Taipei, Taiwan
Phone: +886 2 2627-1111
conamic.basematerials.tw@heraeus.com

www.heraeus-conamic.com