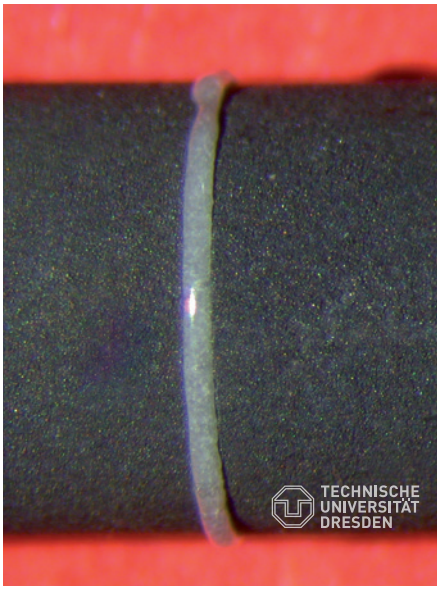
SCHOTT Glass and Glass-Ceramic Sealants for Technical Ceramics in High-Temperature Applications

Product Information

Aluminum oxide, zirconium oxide and silicon carbide have high temperature resistance. Hence, these ceramics are commonly used in high-temperature sensor applications such as in the combustion chamber or exhaust track of automobiles.

SCHOTT has developed special glasses and glass-ceramics for the joining of these technical ceramics. The sealants are stable at elevated temperatures and are chemically resistant, thereby contributing to the stability of the ceramic applications over an extended period of time.



Joining of SiC ceramic with SCHOTT sealing glass.

Advantages

- CTE-matched sealing glasses for Al_2O_3, ZrO_2 and SiC substrates
- Sealing glasses are available for operating temperatures in the range 530 – 1040 °C and CTE in the range 4.6 – 10.1 10^{-6}/K
- Seals can be achieved through conventional heating (in furnace) as well as through laser welding
- Glass sealants have excellent electrical insulation
- Sealants are available in powder, paste and preform formats

Sealing Partner	SCHOTT Glass Number	CTE* (10^{-6}/K for 200 – 300 °C)	T_g (°C)	Sealing temperature (°C)	Maximum operating temperature (°C)
SiC	8253	4.6 (glassy)	785	1320	735 (glassy)
Al_2O_3	G018-266	6.9 (glassy)	585	770	530 (glassy)
	G018-346	7.3 (glassy)	720	1270	670 (glassy)
	G018-358	8.5 (glassy) | 8.8 (p.c.)**	658	940	600 (glassy) | 1040 (p.c.)**
ZrO_2	G018-339	9.2 (p.c.)**	627	990	760 (p.c.)**
	G018-311	9.1 (glassy) | 9.8 (p.c.)**	622	850	560 (glassy) | 880 (p.c.)**
	G018-340	10.1 (glassy) | 10.1 (p.c.)**	602	850	550 (glassy) | 920 (p.c.)**

* CTE = coefficient of thermal expansion ** p.c. = partially crystalline

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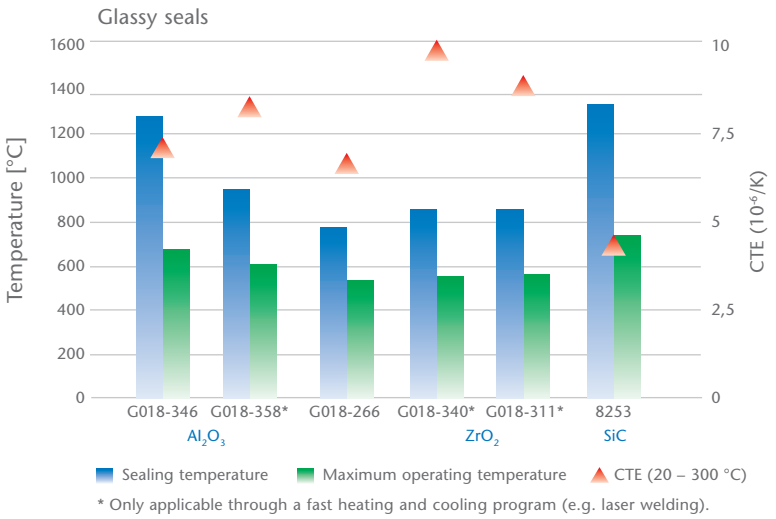
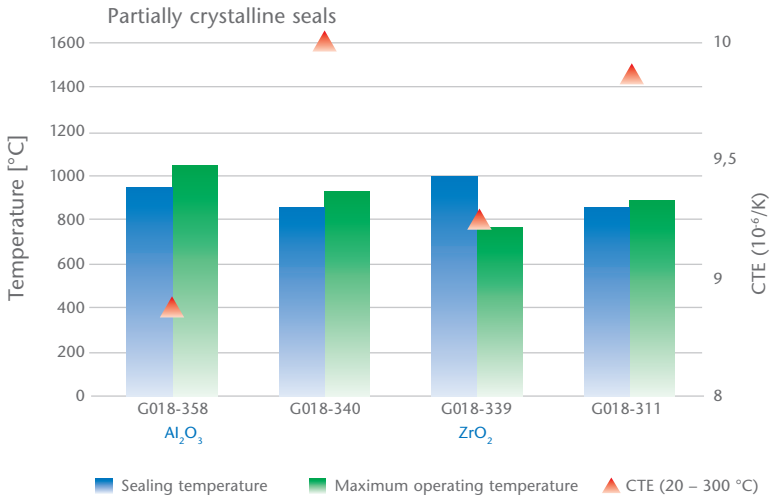
SCHOTT sealants are available in 2 different states due to differences in the processing method:

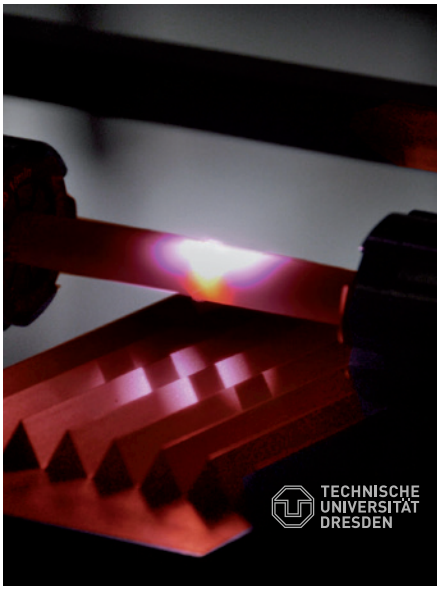
1. Glassy seals
   Advantage: Short processing time



* Only applicable through a fast heating and cooling program (e.g. laser welding).

2. Partially crystalline seals through an optimized heating and cooling program allowing for crystallization to take place.
   Advantage: Stable at higher operating temperatures





Sealing of the technical ceramic can be achieved through a conventional temperature program in a furnace or through laser welding.

Photo courtesy of Institute for Power Engineering, TU Dresden, Germany

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