

# Glass and Glass Ceramic Sealants for Solid Oxide Fuel Cells (SOFC)

## Product Information

Solid Oxide Fuel Cells (SOFC) are considered one of the most promising techniques for the efficient and environmentally-friendly production of energy. The high operating temperature of 600 °C to 900 °C and the aggressive conditions within the cell (fuel, oxidant and humidity) make high demands on all materials used. For the secure and stable combination of multiple cells into a high-performance cell stack, the metallic layers that serve as interconnects between the individual cells require hermetic sealing.

SOFC sealing materials are specially formulated glasses and glass-ceramics that withstand the harsh environments and high operating temperatures of SOFCs. Sealing glass pastes made of glass powder and an organic binding agent are applied to the interconnect plates through dispensing or screen printing. Green sheets are also available upon request.

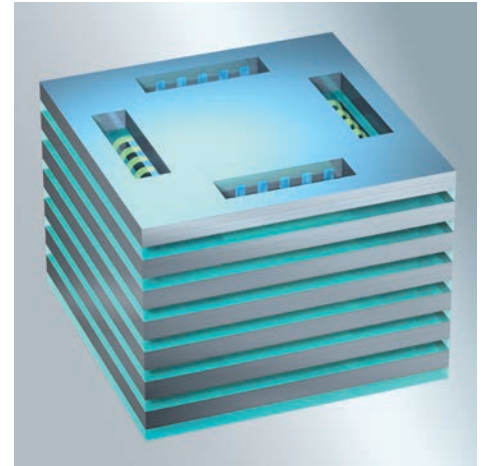
Besides providing hermetic sealing, i.e. inhibiting fuel-oxidant mixing, the sealing material also serves as electrical insulation with a high electrical resistance at operating temperatures. Moreover, they feature chemical stability under reducing and oxidizing atmospheres and have a matched coefficient of thermal expansion (CTE) to prevent material stress within the structure.

## Advantages

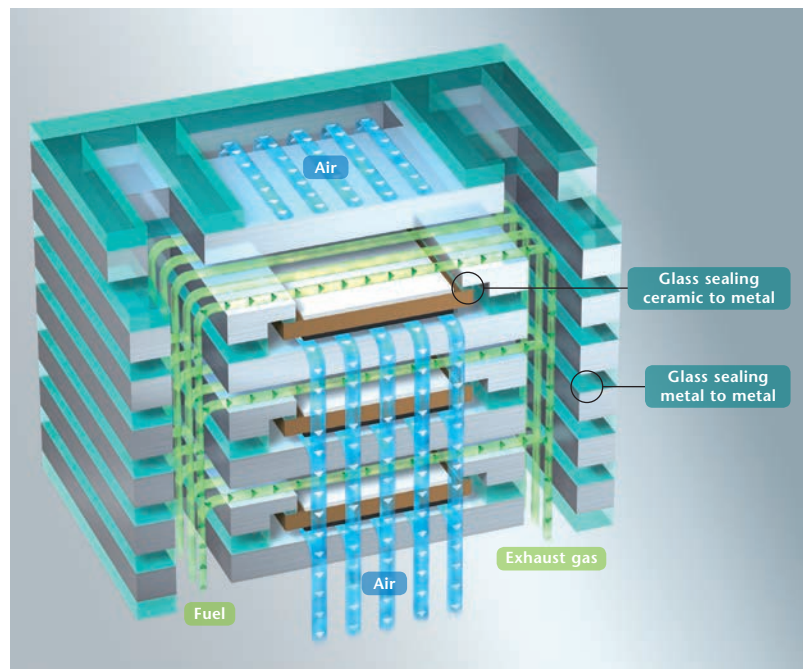
- Ideal thermal cycling achieved by well-matched CTE to the different interconnect and ceramic components
- Crystallizing glasses and glass ceramics with a stable structure for constant, long-lasting properties
- High amorphous glass phase for "self-healing" characteristics
- Usage of materials with a broad range of sealing temperatures available
- Excellent electrical insulation
- Alkaline free
- Compliant alkali silicate glasses also available

## Cell and stack sealing for different SOFC end applications

- Stationary power supply
- Micro-CHPs (combined heat and power generation)
- Mobile applications for cars, trucks, campers and vessels



Solid Oxide Fuel Cell



Glass and Glass Ceramic Sealants in a Fuel Cell Stack

# Glass and Glass Ceramic Sealants for Solid Oxide Fuel Cells (SOFC)

## Physical properties of SCHOTT sealing glasses for stainless steels, Crofer® and ITM

SCHOTT Glass Code	GM31107	G018-311	G018-354	G018-391
$\alpha_{20-300}$ ( $10^{-6}/K$ )*	9.8	9.9	9.2	9.8
$T_g$ (°C)	543	612	637	640
Dilatometric softening point [°C]	592	686	711	708
$\rho$ (g/cm <sup>3</sup> )	3.70	3.80	3.90	3.97
Sealing temperature [°C]	700	850	850	900
Typical operation temperature [°C]	650-750	750-850	800-850	800-850

\* partially crystalline; Crofer®: Registered trademark of Thyssen Krupp; ITM: Trademark of Plansee

## Physical properties of SCHOTT sealing glasses for CFY

SCHOTT Glass Code	G018-281	G018-381	G018-385	G018-394
$\alpha_{20-300}$ ( $10^{-6}/K$ )*	12.1	12.1	8.0	8.7
$T_g$ (°C)	639	652	992	681
Dilatometric softening point [°C]	> 850	> 850	> 1000	763
$\rho$ (g/cm <sup>3</sup> )	2.70	2.30	3.14	3.48
Sealing temperature [°C]	1000	950	870	900-950
Typical operation temperature [°C]	850-950	850-950	850-950	850-950

\* partially crystalline; CFY: Trademark of Plansee

## Expertise in special glass technology

More than one hundred SCHOTT standard glass types as well as different dry and wet grinding methods including SCHOTT patented technologies are utilized and result in a wide range of glass powder products. SCHOTT translates specific physical and chemical requirements into tailor-made solutions for a variety of applications.

- 125 years of melting experience ensure excellent purity and a consistently high quality level
- Large assortment of standard and custom-made glass formulations
- State-of-the-art grinding technologies to ensure application-specific grain size distributions and purity of powders
- Full support from sample quantities to mass production



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