

# Glass Ceramic Sealants for Solid Oxide Fuel Cells

Broad portfolio of highly durable standard and customized sealing glasses from a reliable partner

## Product Information

The high operating temperatures of 600°C to 1000°C and the aggressive conditions within Solid Oxide Fuel Cells (SOFC) make high demands on all materials used. For the secure and stable combination of multiple cells into a high-performance planar cell stack, the metallic layers that serve as interconnects between the individual cells require hermetic sealing. For tubular geometries, the cells must also be hermetically joined.

Compared to other available sealing materials, the use of high quality glass ceramic sealants provides the following advantages:

- Excellent long-term gas-tightness at high temperatures and after thermal cycling.
- Electrical insulation at operating temperature, achievable with an alkali-free glass.
- High chemical stability under reducing and oxidizing atmospheres.

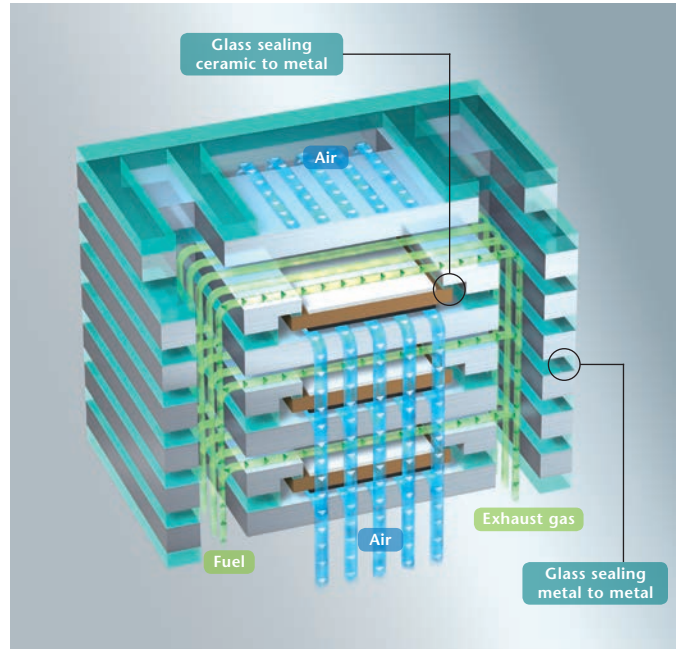
## Advantages of SCHOTT SOFC sealing glasses

We can offer the perfect sealing glass that matches your individual requirements:

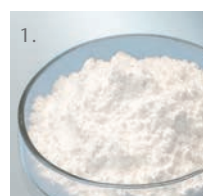
- **Broad portfolio of highly durable standard and customized sealing glasses:**
  - Glasses available with viscosity curves adjusted to the particular operating temperature of different SOFC designs from 600 to 1000°C
  - Glasses available for all relevant commercial interconnect alloys
  - Glasses available with different crystallization behaviour
- **Reproducible high purity:** through dedicated melting and grinding facilities
- **Variety of supply forms:** sealing glasses are available as powders, pastes, sintered preforms or green sheets

## Additional benefits of working with SCHOTT

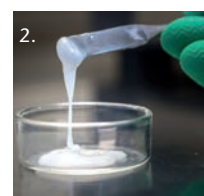
- **Reliable technical support and long-term supply security**  
By working with us you benefit from a close and long-term development- and production partnership with an established partner.
- **Active local support through international presence**



Glass and Glass Ceramic Sealants in a Fuel Cell Stack



1.



2.



3.



4.

1. Powders
2. Pastes
3. Sintered Preforms
4. Green Sheets

**SCHOTT**  
glass made of ideas

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## Physical properties of standard SCHOTT SOFC sealing glasses

	Low temperature	Intermediate temperature		High temperature			
<b>SCHOTT SOFC sealing glasses</b>	<b>GM31107</b>	<b>G018-311</b>	<b>G018-354</b>	<b>G018-281</b>	<b>G018-381</b>	<b>G018-385</b>	<b>G018-394</b>
Suitable for typical SOFC operating temperatures [°C]	650-750	750-800	750-850	850-950	850-950	850-950	850-950
Sealing temperature [°C]	700	850	850	1000	950	1000	900-950
Coefficient of thermal expansion $\alpha_{20-300}$ ( $10^{-6}/K$ )*	9,8	9,9	9,2	12.1	12.1	8.4	8.7
$T_g$ [°C]	534	612	637	639	652	992	681
Dilatometric softening point [°C]	592	686	711	> 850	> 850	> 1000	763
Compatibility with	ITM, Crofer®, StS	ITM, Crofer®, StS	ITM, Crofer®, StS	CFY	CFY	CFY	CFY

\* partially crystalline; ITM: Intermediate Temperature Metal; Crofer®: registered trademark of Thyssen Krupp; StS: Stainless Steel; CFY: Cr5FeY



### Comprehensive experience in special glass

SCHOTT is a world leading developer and manufacturer of specialty glasses with a 130 year history. The SCHOTT Group maintains close proximity to its customers with manufacturing and sales units in 35 countries and a workforce of around 15,400 employees worldwide.



### Hermetic sealing know-how

SCHOTT's Business Unit Electronic Packaging has more than 70 years of experience in developing and manufacturing special glass materials, hermetic housings and other components for the reliable, long-term protection of sensitive electronics for a diverse range of harsh environment applications. Electronic Packaging employs 1,500 people at five production locations in Germany, the Czech Republic, Singapore, U.S.A. and Japan.



### Expertise in glass powder technology

The expertise in the development of application-specific sealing glasses and the grinding thereof into fine glass powder is essential for virtually all of SCHOTT's hermetically sealed products. Technical glass powders are used for a broad variety of challenging technical applications. The development of sealing materials for Solid Oxide Fuel Cells at SCHOTT started in the early 90's.

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