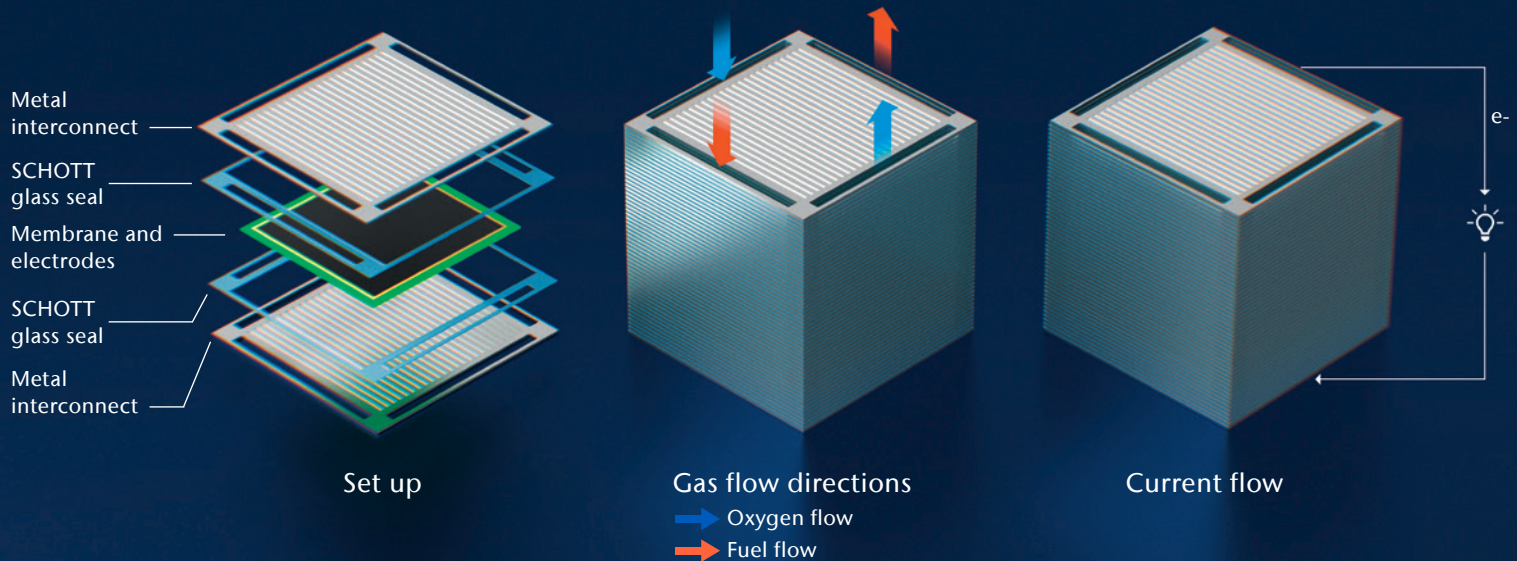


# Glass-Ceramic Sealants for SOECs/SOFCs

## Broad portfolio of highly durable sealing glasses



Solid Oxide Electrolyzer Cells (SOECs) efficiently convert electrical power into high purity gases, e.g. hydrogen, while Solid Oxide Fuel Cells (SOFCs) convert chemical energy from fuels into electrical power. In both applications, the stack materials are subject to high temperatures of 600°C to 950°C.

SCHOTT is a leading supplier of specialty glasses that are used to hermetically seal the interconnects. The sealing is essential to prevent the uncontrolled exchange of gas, enabling high efficiency and a long lifetime for these vital cells.

### Benefits

- 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
- Broad portfolio of highly durable standard and customized sealing glasses:
  - viscosity curves adjusted to operating temperatures from 600°C to 950°C
  - for all relevant commercial interconnect alloys
  - different crystallization behavior
- Reproducible high purity through dedicated melting and grinding facilities
- Various supply forms available: powders, pastes, sintered preforms, or green sheets

# Glass-Ceramic Sealants for SOECs/SOFCs

## Broad portfolio of highly durable sealing glasses

Overview of standard SOEC/SOFC sealing glasses from SCHOTT

Glass type	Glass transformation Tg (glassy)	Working point (glassy) T@η=10 <sup>4</sup> dPa·s	Coefficient of thermal expansion (20 – 300°C) (glassy)	Glass transformation Tg (crystalline)	Dilatometric softening point (crystalline)	Coefficient of thermal expansion (20 – 300°C) (crystalline)
	[°C]	[°C]	[ppm K <sup>-1</sup> ]	[°C]	[°C]	[ppm K <sup>-1</sup> ]
GM31107	533	736	9.9	534	592	9.8
G018-315*	575	n/a	10.1	593	663	9.7
G018-311	620	873	9.1	612	686	9.9
G018-354	642	908	9.0	642	711	9.2
G018-451*#	600	890	10.4	565	>900	10.5
G018-392*	591	n/a	10.6	582	680	11.4
G018-391*	650	n/a	9.3	636	727	9.7
G018-394	677	973	8.6	681	763	8.7
G018-281	652	1191	4.6	639	>850	12.1
G018-381*	n/a	n/a	n/a	652	>850	12.1
G018-385	692	962	8.4	992	>1000	8.4

\* preliminary data – pilot production | # equivalent to PNNL G-18 composition

### Design parameters and stack operation temperatures

Glass type	Suggested cell design	Suggested sealing temperature	Normal operation temperature range	Peak operation temperature
		[°C]	[°C]	[°C]
GM31107	MSC	700	600-650	700
G018-315*	MSC, ASC	800	600-650	750
G018-311	ASC	850	700-750	800
G018-354	ASC	850	700-750	800
G018-451*#	ASC	850	700-750	800
G018-392*	ASC, ESC	850	700-800	825
G018-391*	ASC, ESC	900	700-750	800
G018-394	ESC	950	800-900	950
G018-281	ESC	950	800-900	1000
G018-381*	ESC	950	800-900	1000
G018-385	ESC	1000	800-900	1000

MSC: metall-supported cell; ASC: anode-supported cell; ESC: electrode-supported cell



Powders



Pastes



Green sheets

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