

## Product Features



### 1 Enables Bonding of Dissimilar Materials

Enables selection of materials to be bonded (such as glass, ceramics, and metals) with a variety of coefficients of thermal expansion depending on the application

### 2 Wide Range of Firing Temperatures

Compatible with a wide range of operating temperatures

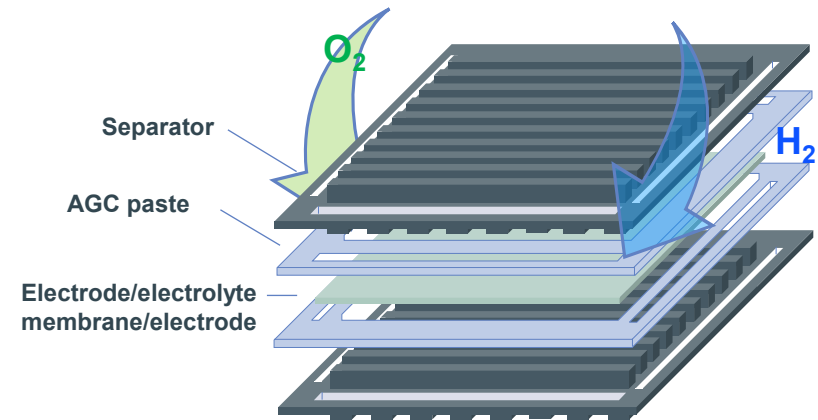
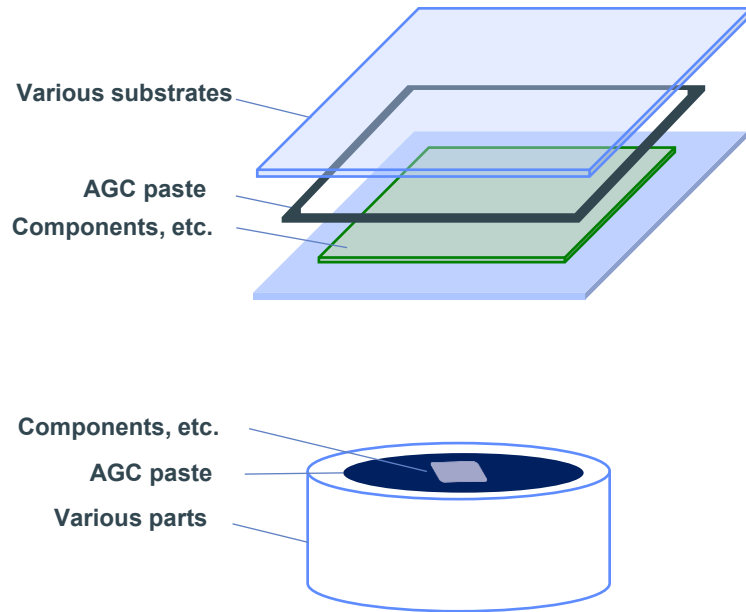
### 3 Enables High Hermetic Sealing

Ensures a high level of hermetic sealing in **normal atmospheric environments** and under low load.

### 4 Proven Track Record in a Wide Range of Applications

- Package sealing of electronic parts
- Sensor sealing ■ Fuel cell components ■ Automotive parts

- Solid oxide fuel cell (SOFC)



**P3, 4: Products for sealing**

**P5: Products for SOFC**

# Powder Glass for sealing

**Point!**

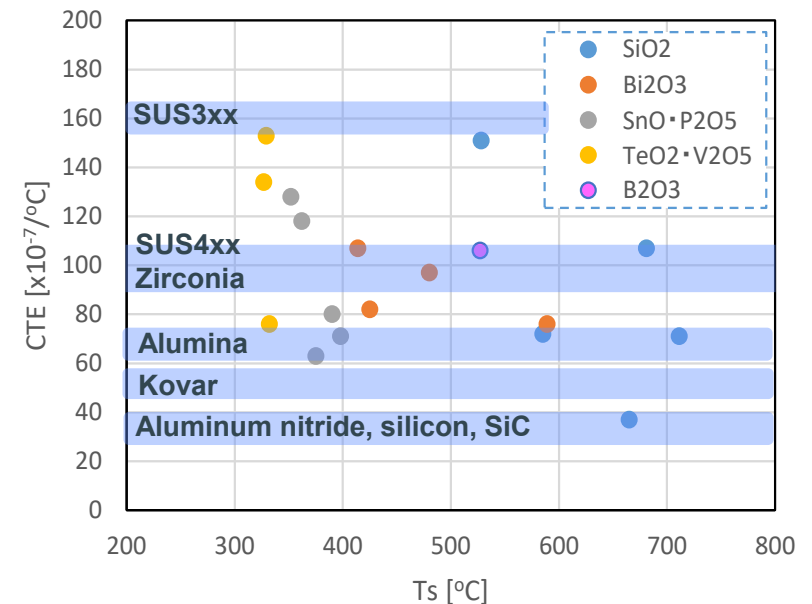
AGC sealing glass powders are available in a wide range of softening points and coefficients of thermal expansion, making them suitable for a broad range of operating temperatures and various substrates. We also offer customization to meet specific requirements.



■ Main product lineup

Product name	Glass type	Tg [°C]	Ts [°C]	Ts-Tg [°C]	CTE [x10 <sup>-7</sup> /°C]
1991Y10	SiO <sub>2</sub>	418	528	110	151
SG354		567	681	114	107
KAC-31-N2L		509	711	203	71
ASF-6004A		474	585	111	72
7574		567	665	98	37
ASF-2511C	Bi <sub>2</sub> O <sub>3</sub>	353	425	72	82
KF9173		403	480	77	97
KFI0115B		357	414	57	107
YFT-531E		493	589	96	76
ASF-1898	B <sub>2</sub> O <sub>3</sub>	433	527	94	106
9079-150	SnO•P <sub>2</sub> O <sub>5</sub>	287	362	75	118
FP67		285	390	105	80
FP74		275	375	100	63
KP312		280	352	72	128
KP312E		280	398	118	71
TNS062		TeO <sub>2</sub> •V <sub>2</sub> O <sub>5</sub>	271	327	56
TNS062HS	266		332	66	76
NTX-2D	274		329	55	153

■ Relationship between Ts (glass softening temperature) and CTE (coefficient of thermal expansion)



**Point!**

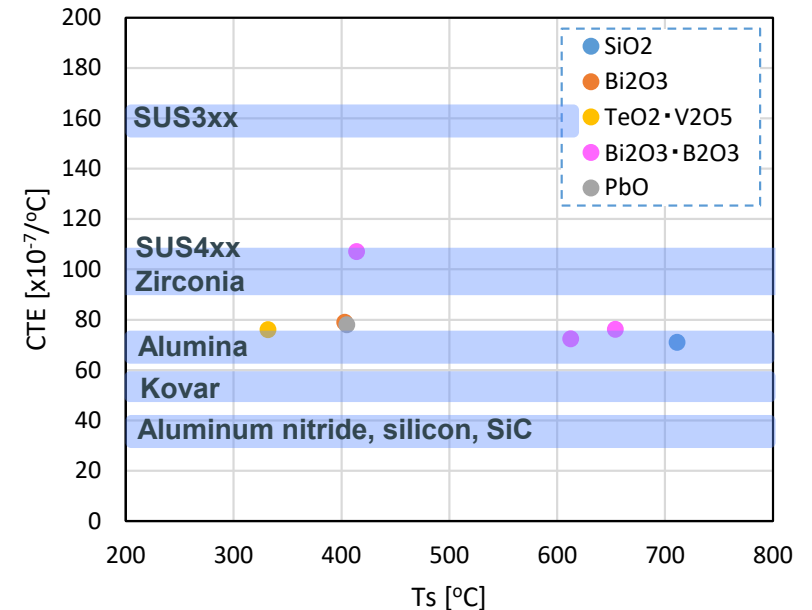
AGC sealing pastes are available in a wide range of softening points and coefficients of thermal expansion, making them suitable for a broad range of operating temperatures and various substrates. We also offer customization to meet specific requirements.



■ Main product lineup

Product name	Glass type	Tg [°C]	Ts [°C]	Ts-Tg [°C]	CTE [x10 <sup>-7</sup> /°C]
AR-A312	SiO <sub>2</sub> 系	509	711	203	71
AP4115AB	Bi <sub>2</sub> O <sub>3</sub> 系	345	403	58	79
P-TNS062HS	TeO <sub>2</sub> ·V <sub>2</sub> O <sub>5</sub> 系	266	332	66	76
AP4290D1	PbO	332	405	73	78
KFI0115B-P200	Bi <sub>2</sub> O <sub>3</sub> -B <sub>2</sub> O <sub>3</sub> 系	357	414	57	107
HFR-05		513	612	100	72
HFR-24		551	654	103	76

■ Relationship between Ts (glass softening temperature) and CTE (coefficient of thermal expansion)



## Point!

With a wide range of thermal properties available, customers can select the product that best suits their substrate bonding materials and process conditions.

For the 850°C firing type, we can further fine-tune the coefficient of thermal expansion by controlling the precipitated crystalline phase.

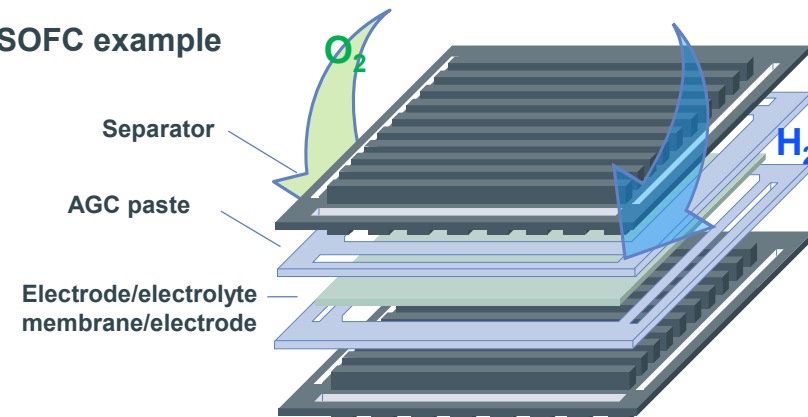
### ■ Main product lineup (Frit)

Product name	Sealing temperature [°C]	T <sub>g</sub> [°C]	T <sub>s</sub> [°C]	CTE [x10 <sup>-7</sup> /°C]	
				50-350 [°C]	50-Sealing temp [°C]
DSG006-S6	750	611	705	92	106
DSG006La4	800	619	710	118	127
CM251-H4	850	603	702	94	109
CM251-ZL5	850	680	775	95	113
CM251-ZL	850	662	757	109	126
CM251-CS14	850	670	747	106	117
HHR09101	950	726	826	92	101

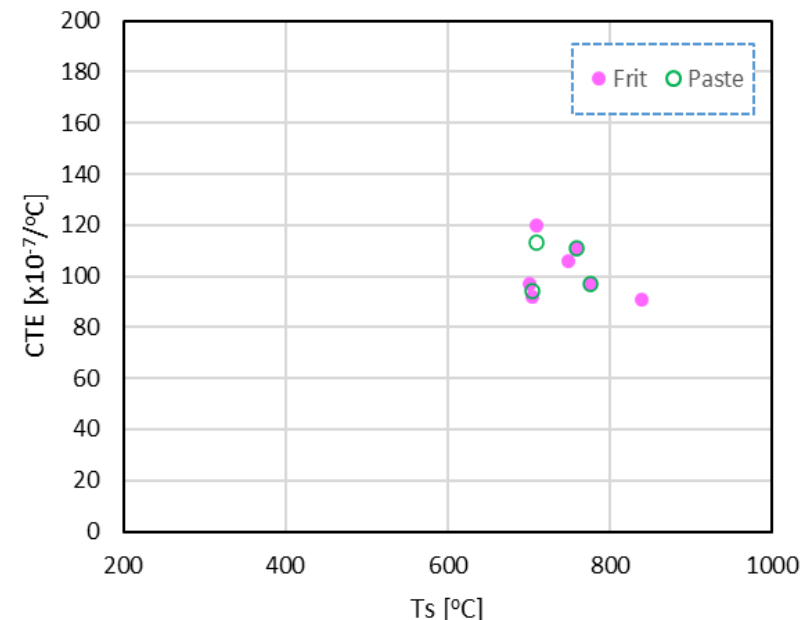
### ■ Main product lineup (Paste)

Product name	Sealing temperature [°C]	T <sub>g</sub> [°C]	T <sub>s</sub> [°C]	CTE [x10 <sup>-7</sup> /°C]	
				50-350 [°C]	50-Sealing temp [°C]
CM251-ZL-P70		659	759	111	
CM251-ZL5-P70		680	776	97	
DSG006La4-P70		619	710	113	
DSG006-S6-P70		611	705	94	

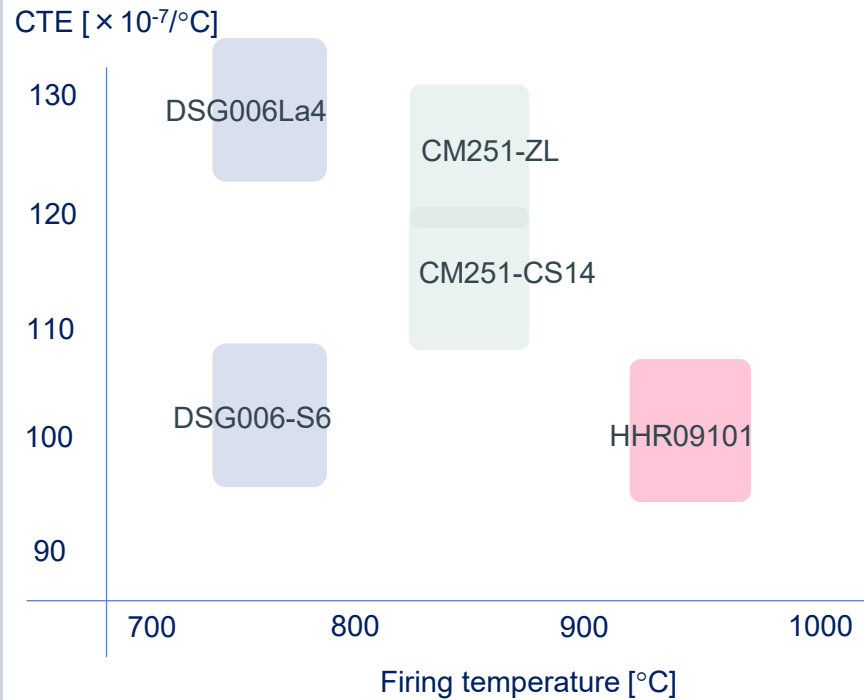
### ■ SOFC example



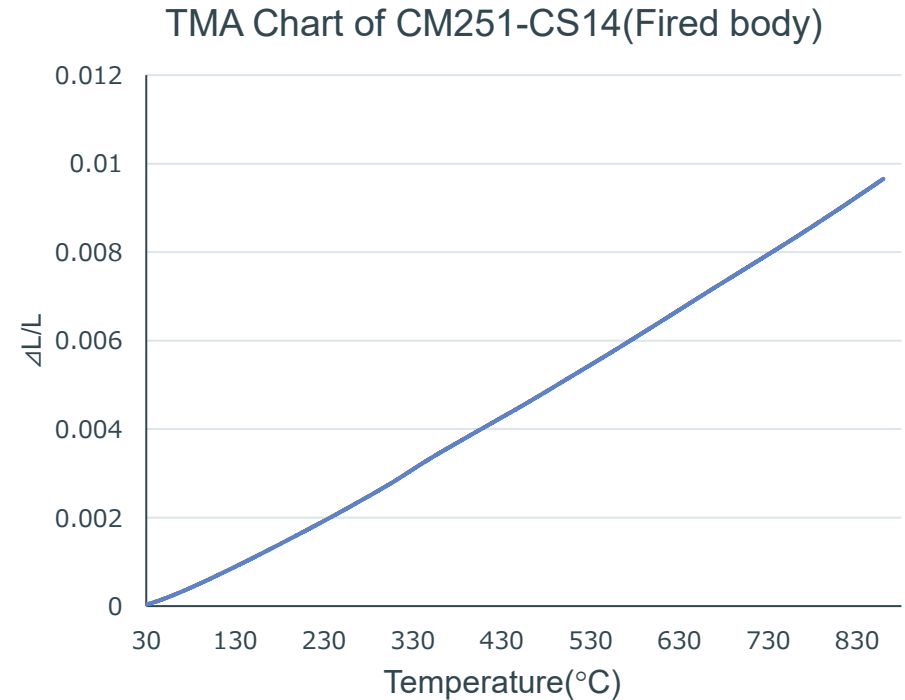
### ■ Relationship between T<sub>s</sub> (glass softening temperature) and CTE (coefficient of thermal expansion)



## Firing temperature and CTE



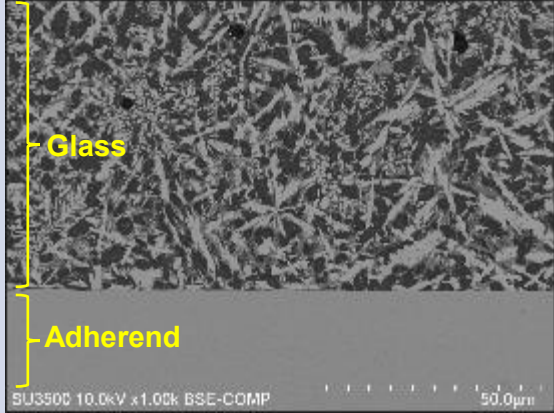
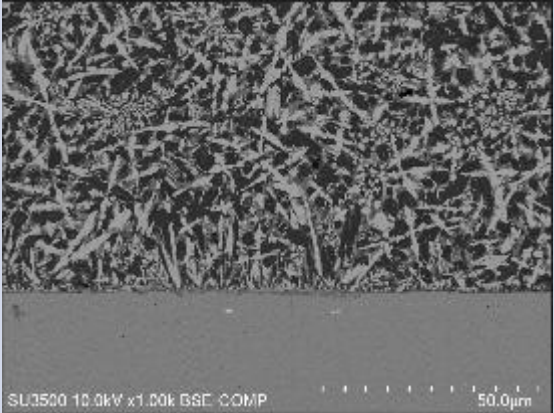
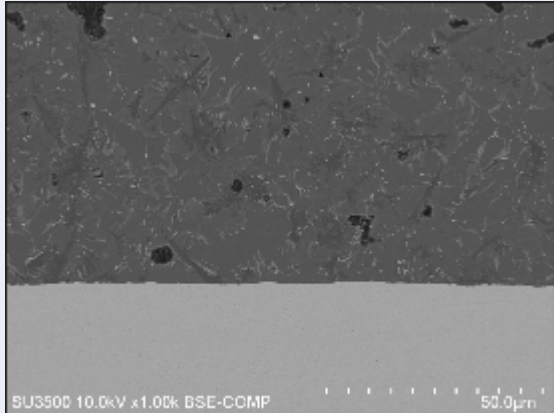
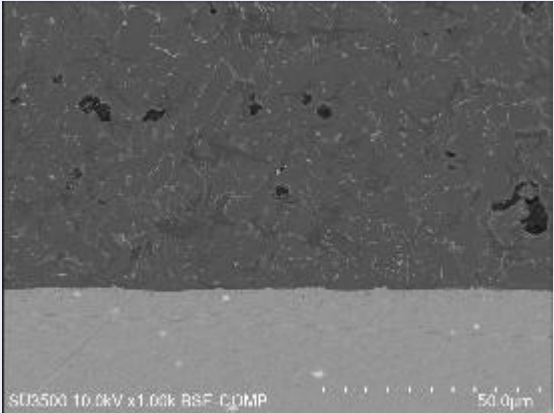
## TMA chart for CM251-CS14



### Point!

- Crystallization occurs after the sintering and flow-sealing processes, providing excellent thermal resistance.
- The CTE exhibits minimal temperature dependence, helping to suppress stress concentration during temperature fluctuations.
- The composition is designed to ensure chemical durability.
- This composition allows for a wide range of property adjustments.

# Product Characteristics (Examples)

Product name	Sealing temperature	YSZ	Ferritic SUS
CM251-CS14	850°C		
HHR09101	950°C		

## Point!

Optimizing the glass composition can suppress interfacial reactions and prevent abnormal phase formation.



# END

**We will do our utmost to help  
you make your dreams come true.**

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**AGC**  
Your Dreams, Our Challenge

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