



# POWDER GLASS GLASS PASTE

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(AGC Frit HP) [http://www.agc.com/en/products/electoric/detail/glass\\_frit\\_paste.html](http://www.agc.com/en/products/electoric/detail/glass_frit_paste.html)

(Inquiry Form) [https://contact.agc.com/webapp/form/17985\\_tpab\\_46/index.do](https://contact.agc.com/webapp/form/17985_tpab_46/index.do)

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July 2022

## The following criteria should govern your selection of Powder Glass:

### ● Thermal expansion coefficient

It is normally desirable to apply compressive stress to the glass after sealing, so choose a powder glass which has a smaller thermal expansion coefficient than the materials being sealed. The difference is between 0 and  $15 \times 10^{-7}/^{\circ}\text{C}$ .

### ● Sealing temperature

To form a good seal, the powder glass must properly wet toward the material being sealed, so its temperature above the softening point of the glass should be raised.

### ● Particle size

Particles of powder glass for molds or paints generally pass 100~150 mesh, while those for screen-printing generally pass 250~325 mesh. Various types of particle distribution are available by request.

### ● Privacy Policy

- All properties reported here are representative values.
- All information could be subject to change without notice.
- Lead-free used herein means that lead is not an intentional ingredient.

### ● Definition

**R<sub>2</sub>O** : R<sub>2</sub> can be any alkali metal (K, Na or Li)

**RO** : R can be any alkaline earth metal (Mg, Ca, Sr or Ba)

**Thermal expansion coefficient(CTE)** : The average ratio by which the glass expands when heating per 1°C.

**Transition point(Tg)** : The temperature at which the glass structure changes, with viscosity of approx.  $10^{13.3}$  poise.

(Values are the temperature on the shoulder at the first thermal absorption region on the DTA curve. The exception specified in the list individually.)

**Softening point(Sp, Ts)** : The temperature at which glass deforms under its own weight, with a viscosity of about  $10^{7.6}$  poise.

(Sp values are temperature at the peak of the third thermal inflection point on the DTA curve. Ts values are temperature at the peak the fourth inflection point. The exception specified in the list individually.)

**Crystallization temperature(Tc)** : The temperature at which the heat of crystallization of a crystalline glass reaches a maximum while it is being heated. (The peak temperature for thermal dissipation on the DTA curve.)

**Average particle size** : Mean particle diameter. (Permeability method)

**Particle size (D50)** : Median particle diameter. (Laser diffraction method)



Be sure to remember the following considerations when using AGC glass powder.

● **Product Form**

- The products are produced by milling glass material .
- Basically the products are packed in aluminum bag.

● **Handling**

Glass powder could be used by mixing with ceramic filler or pigment, and also mixed with organic solvent as appropriate.

When the shape of sealing area is fixed, glass powder could be pressed and preform could be made by pressing and casting glass powder.

● **Storage locations**

Avoid direct exposure to sunlight and store in a cool, well-ventilated place.

Please ask the sales person about expiry date of each pastes.

**Powder Glass for Binder (1)**

Code	Glass Type	Specific Gravity	Firing Condition (°C-min)	CTE( $\alpha$ )		D T A Properties				Particle Properties		Glass Characteristics	Application
				( $\times 10^{-7}/^{\circ}\text{C}$ )	Temp range (°C)	Tg (°C)	Sp (°C)	Ts (°C)	Tc (°C)	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		
ASF-1094	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	5.4	550-10	79	50-350	466	-	526	-	-	0.8	V	Electronic parts
ASF-1096	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	6.7	400-15	120	50-350	355	-	405	465	-	1.0	D	Electronic parts
ASF-1097	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · Al <sub>2</sub> O <sub>3</sub>	5.2	600-15	70	50-350	520	-	605	-	-	2.3	V	Electronic parts
ASF-1098	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	5.5	600-10	54	50-350	441	-	517	535	-	3.0	D	Electronic parts
ASF-1099	ZnO · Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	4.7	600-10	42	50-350	475	-	516	562	-	3.5	D	Electronic parts
ASF-1100	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	6.3	460-30	107	50-350	380	-	440	530	-	5.2	D	Electronic parts
ASF-1100B	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	6.3	460-30	107	50-350	382	-	439	520	-	1.1	D	Electronic parts
ASF-1109	Bi <sub>2</sub> O <sub>3</sub> · ZnO · B <sub>2</sub> O <sub>3</sub>	5.1	580-5	65	50-350	461	-	537	-	-	2.8	V	Electronic parts
ASF-4001B	Bi <sub>2</sub> O <sub>3</sub> · ZnO · B <sub>2</sub> O <sub>3</sub>	6.8	520-10	90	50-350	406	-	472	-	-	0.6	V	Electronic parts
SK231-300	Bi <sub>2</sub> O <sub>3</sub> · BaO · B <sub>2</sub> O <sub>3</sub>	5.1	620-15	84	30-300	491	559	580	-	4.0	5.8	V	Electronic parts
<b><i>NTX-2W</i></b>	TeO <sub>2</sub> · V <sub>2</sub> O <sub>5</sub> · Bi <sub>2</sub> O <sub>3</sub>	5.2	380-10	152	30-250	275	307	328	-	-	1.0	V	Electronic parts
ASF-1216	PbO · SiO <sub>2</sub>	4.3	600-15	63	50-350	468	-	576	-	-	1.7	V	Electronic parts
ASF-1290A4	PbO · B <sub>2</sub> O <sub>3</sub>	6.3	430-10	105	30-300	332	-	394	-	-	3.9	V	Electronic parts
ASF-1330	PbO · B <sub>2</sub> O <sub>3</sub>	5.6	500-15	92	50-350	380	-	445	-	2.0	2.0	V	Electronic parts
ASF-1370	PbO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	3.8	650-15	52	50-350	465	-	615	-	2.1	1.9	V	Electronic parts
<b><i>JP-1</i></b>	SiO <sub>2</sub> · PbO	3.5	865-30	40	50-600	637	-	829	-	-	4.0	V	Electronic parts

※***Italic : Development products***

V:Vitreous,D:Devitrifying

**Powder Glass for Binder (2)**

Code	Glass Type	Specific Gravity	Firing Condition (°C-min)	CTE( $\alpha$ )		D T A Properties				Particle Properties		Glass Characteristics	Application
				( $\times 10^{-7}/^{\circ}\text{C}$ )	Temp range (°C)	Tg (°C)	Sp (°C)	Ts (°C)	Tc (°C)	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		
ASF-1317	SiO <sub>2</sub> · BaO · B <sub>2</sub> O <sub>3</sub>	3.1	810-10	55	50-350	585	-	730	-	-	1.5	V	Electronic parts
ASF-1560	SiO <sub>2</sub> · ZnO · CaO	3.3	850-15	73	50-350	670	-	780	815	1.7	2.2	D	Electronic parts
ASF-1561	SiO <sub>2</sub> · ZnO · CaO	3.4	850-10	75	50-350	640	-	750	892	-	3.5	D	Electronic parts
ASF-1620B	ZnO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	3.7	850-15	55	50-350	570	-	656	759	-	4.5	D	Electronic parts
ASF-1700	SiO <sub>2</sub> · BaO · ZnO	3.6	850-15	72	50-350	680	-	813	890	1.6	2.0	D	Electronic parts
ASF-1702	BaO · SiO <sub>2</sub> · ZnO	3.8	950-15	119	50-350	679	-	807	911	-	2.6	D	Electronic parts
ASF-1717B	SiO <sub>2</sub> · BaO · ZnO	3.3	850-10	35	50-350	677	-	808	846	-	2.5	D	Electronic parts
ASF-1761	SiO <sub>2</sub> · RO	3.0	1000-15	69	50-350	710	-	870	-	-	5.2	V	Electronic parts
ASF-1780	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · BaO	2.5	850-15	52	50-350	538	-	783	-	3.1	4.9	V	Electronic parts
ASF-1891	ZnO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	3.5	800-10	66	50-350	488	-	587	710	-	2.8	D	Electronic parts
ASF-1891F	ZnO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	3.5	800-10	63	50-350	495	-	589	707	-	1.5	D	Electronic parts
ASF-1898B	BaO · B <sub>2</sub> O <sub>3</sub> · ZnO	3.4	600-10	106	50-350	442	-	526	710	-	1.1	D	Electronic parts
ASF-1930	SiO <sub>2</sub> · TiO <sub>2</sub> · R <sub>2</sub> O	2.8	800-15	113	50-350	570	-	660	805	-	3.0	D	Electronic parts
ASF-1939	BaO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	3.7	850-15	88	50-350	620	-	716	unclear	-	1.3	D	Electronic parts
ASF-1941B	BaO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	3.7	700-15	90	50-350	591	-	683	-	-	1.2	V	Electronic parts
<b><i>K-301</i></b>	RO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	3.1	-	90	30-300	561	633	665	> 800	-	7.0	D	Electronic parts
<b><i>K-304</i></b>	RO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	2.9	490-60	106	30-250	444	503	525	614	-	9.0	D	Electronic parts
<b><i>K-807</i></b>	BaO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	3.5	-	75	30-300	657	739	780	-	-	8.0	V	Electronic parts
<b><i>K-808</i></b>	BaO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	3.4	-	70	30-300	666	758	795	-	-	8.0	V	Electronic parts
<b><i>K-835</i></b>	ZnO · B <sub>2</sub> O <sub>3</sub>	3.8	680-10	35	50-350	545	-	unclear	680	-	7.0	D	Electronic parts
LS-5-300M	SiO <sub>2</sub> · BaO · Li <sub>2</sub> O	2.9	620-15	105	30-300	490	575	610	675	-	10.0	D	Electronic parts
<b><i>200GF</i></b>	SiO <sub>2</sub> · R <sub>2</sub> O · BaO	2.5	750-30	105	50-300	472	-	648	-	-	5.0	V	Electronic parts
1724-1.5	SiO <sub>2</sub> · Al <sub>2</sub> O <sub>3</sub> · CaO	2.6	950-10	45	50-350	744	-	913	-	-	1.6	V	Electronic parts

※*Italic : Development products*

V:Vitreous,D:Devitrifying

**Powder Glass for Low Temperature sealing**

Code	Glass Type	Specific Gravity	Firing Condition (°C-min)	CTE( $\alpha$ )		D T A Properties				Particle Properties		Glass Characteristics	Application
				( $\times 10^{-7}/^{\circ}\text{C}$ )	Temp range (°C)	Tg (°C)	Sp (°C)	Ts (°C)	Tc (°C)	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		
<b><i>TNS062</i></b>	TeO <sub>2</sub> · V <sub>2</sub> O <sub>5</sub>	4.2	380-10	134	30-250	271	-	327	-	-	9.1	V	Low temp sealing
<b><i>TNS062-ZC2</i></b>	TeO <sub>2</sub> · V <sub>2</sub> O <sub>5</sub>	4.0	380-10	84	30-250	270	-	340	-	-	2.8	V	Low temp sealing
<b><i>NTX-2D</i></b>	TeO <sub>2</sub> · V <sub>2</sub> O <sub>5</sub> · Bi <sub>2</sub> O <sub>3</sub>	5.2	380-10	153	30-250	274	-	329	-	-	22.7	V	Low temp sealing
KF9173	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	6.4	520-10	98	30-300	403	459	480	-	3.5	11.0	V	Seathed heaters
ASF-2511C	Bi <sub>2</sub> O <sub>3</sub> · ZnO	6.4	500-10	82	30-300	353	398	425	-	-	8.0	V	Soda-Lime Glass sealing
<b><i>KFI0115B</i></b>	Bi <sub>2</sub> O <sub>3</sub> · ZnO · B <sub>2</sub> O <sub>3</sub>	7.4	470-10	107	30-300	357	400	414	-	-	1.2	V	Stainless sealig
<b><i>YFT-531E</i></b>	Bi <sub>2</sub> O <sub>3</sub> · ZnO · B <sub>2</sub> O <sub>3</sub>	4.8	590-10	76	50-350	493	-	589	-	-	2.7	V	-
<b><i>YFT-525G</i></b>	B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub> · ZnO	2.5	580-10	72	50-350	474	-	585	-	-	2.9	V	-
ASF-1898	BaO · B <sub>2</sub> O <sub>3</sub> · ZnO	3.4	600-10	106	50-350	433	-	527	-	-	4.5	V	Seathed heaters
<b><i>SG354</i></b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	3.4	700-10	107	50-350	567	-	681	-	-	2.2	V	Metal sealing
<b><i>1991Y10</i></b>	SiO <sub>2</sub> · R <sub>2</sub> O · TiO <sub>2</sub>	2.8	600-10	150	50-350	410	-	529	-	-	4.5	V	Metal sealing
7574	ZnO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	3.6	775-30	37	50-500	567	647	665	-	10.2	45.0	D	AlN sealing
9079-150	SnO · P <sub>2</sub> O <sub>5</sub>	3.8	480-10	122	50-250	287	344	362	-	-	13.0	V	-
<b><i>FP67</i></b>	SnO · P <sub>2</sub> O <sub>5</sub>	3.6	480-10	79	30-250	285	357	390	-	-	20.0	V	Soda-Lime Glass sealing
FP74	SnO · P <sub>2</sub> O <sub>5</sub>	3.4	480-10	63	30-250	275	355	375	-	4.6	20.0	V	Ceramics sealing
<b><i>KP312</i></b>	SnO · P <sub>2</sub> O <sub>5</sub>	3.8	430-10	128	30-250	280	328	352	-	-	9.0	V	-
<b><i>KP312E</i></b>	SnO · P <sub>2</sub> O <sub>5</sub>	3.5	430-10	71	30-250	280	344	398	-	-	20.0	V	Ceramics sealing

※*Italic : Development products*

V:Vitreous,D:Devitrifying

**Powder Glass for heat resistance**

Code	Glass Type	Heat Resistance Temp.	Firing Condition (°C-min)	CTE( $\alpha$ )		D T A Properties				Particle Properties		Glass Characteristics	Application
				( $\times 10^{-7}/^{\circ}\text{C}$ )	Temp range (°C)	Tg (°C)	Sp (°C)	Ts (°C)	Tc (°C)	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		
<i>CM251-H4</i>	RO · B <sub>2</sub> O <sub>3</sub> · MgO	900	850-60	93	50-350	603	-	702	822	-	10.0	D	SOFC sealing
<i>CM251-ZL</i>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · MgO	900	850-60	108	50-350	662	-	757	891	-	10.0	D	SOFC sealing
<i>CM251-ZL5</i>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · MgO	900	850-60	97	50-350	680	-	775	894	-	10.0	D	SOFC sealing
<i>DSG006La4</i>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	800	800-60	113	50-350	619	-	710	806	-	10.0	D	SOFC sealing
<i>DSG006-S6</i>	ZnO · La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	800	750-60	94	50-350	611	-	705	806	-	10.0	D	SOFC sealing
<i>HHR1010</i>	SiO <sub>2</sub> · CaO · ZnO	1000	1050-60	88	50-350	725	-	840	930	-	10.0	D	SOFC sealing
<i>HHR0706</i>	ZnO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	700	850-60	43	50-350	570	-	656	759	-	4.5	D	AlN sealing
<i>1724-7</i>	SiO <sub>2</sub> · Al <sub>2</sub> O <sub>3</sub> · CaO	700	950-60	45	50-350	741	-	931	-	-	7.0	V	AlN sealing
<i>ER001</i>	SiO <sub>2</sub> · ZrO <sub>2</sub> · R <sub>2</sub> O	-	900-60	66	50-350	687	-	893	-	-	7.0	V	Microreactor sealing

※*Italic : Development products*

V: Vitreous, D: Devitrifying

**Powder Glass for Glass-Ceramic Multilayer Substrate**

Code	Glass Type	Specific Gravity	Firing Condition (°C-min)	CTE( $\alpha$ )		D T A Properties				Particle Properties		Glass Characteristics	Application
				( $\times 10^{-7}/^{\circ}\text{C}$ )	Temp range (°C)	Tg (°C)	Sp (°C)	Ts (°C)	Tc (°C)	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		
ASF-102M	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	2.2	850-60	28	50-350	unclear	-	790	-	-	3.3	V	Multilayer substrate
ASF-102X	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	2.2	850-60	28	50-350	unclear	-	762	-	-	1.1	V	Multilayer substrate
ASF-102Y	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	2.2	850-60	28	50-350	unclear	-	775	-	-	1.3	V	Multilayer substrate
<b>102-0.3</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	2.2	850-60	24	50-350	unclear	-	729	-	-	0.3	V	Multilayer substrate
ASF-1700F	SiO <sub>2</sub> · BaO · ZnO	3.6	850-15	67	50-350	671	-	810	923	-	1.8	D	Multilayer substrate
FF-201	SiO <sub>2</sub> · Al <sub>2</sub> O <sub>3</sub> · MgO	2.6	900-30	50	40-750	720	840	900	1040	-	17.0	D	Multilayer substrate
<b>FF-202</b>	RO · SiO <sub>2</sub> · MgO	3.5	900-20	100	30-300	715	-	840	935	-	4.5	D	Multilayer substrate
<b>DL828</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · Al <sub>2</sub> O <sub>3</sub>	2.3	900-60	36	50-350	unclear	-	860	-	-	1.2	V	Multilayer substrate
<b>BAC13</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	2.2	900-60	34	50-350	unclear	-	870	-	-	1.5	V	Multilayer substrate
<b>BAC13-A6</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	2.8	900-60	56	50-350	unclear	-	885	-	-	1.8	V	Multilayer substrate
<b>DL5000</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	2.5	900-15	43	50-350	unclear	-	869	-	-	2.1	V	Multilayer substrate
ASF-1781B	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	2.2	900-60	33	50-350	unclear	-	919	-	-	1.8	V	Multilayer substrate
<b>DL003B-AC32</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	-	870-120	41	50-350	654	-	820	-	-	2.2	V	Multilayer substrate
<b>FF201-C2X35</b>	SiO <sub>2</sub> · Al <sub>2</sub> O <sub>3</sub> · RO	-	870-120	57	50-350	714	-	808	856	-	1.1	D	Multilayer substrate

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V:Vitreous,D:Devitrifying





Be sure to remember the following considerations when using AGC glass paste.

● **Product Form**

- AGC glass pastes consist of glass powder and vehicle and basically designed for screen printing.
- Basically the products are packed in plastic container.

● **Mixing**

Mix thoroughly before use, taking particular care not to cause air bubbles.

● **Adjusting viscosity**

Pastes have been prepared for use without further adjustment but, if necessary, recommended thinner can be used to adjust their viscosity.

● **Application**

Pastes should be applied in a well-ventilated area. Take particular care not to continue breathing the vapor for any considerable length of time, and do not allow the paste to remain in contact with the skin.

● **Storage locations**

Avoid direct exposure to sunlight and store in a cool, well-ventilated place.

Please use within six months of receipt.

Please ask the sales person about expiry date of each pastes.

**Overcoat Glass Paste for Electronic parts**

Code	Glass Type	Firing Condition (°C-min)	$\alpha$ $\times 10^{-7}/^{\circ}\text{C}$	D T A Properties			Electrical Properties				Paste Viscosity		Particle Properties		Glass Characteristics	Color		Features
				Tg (°C)	Ts (°C)	Tc (°C)	IR ( $\Omega$ )	BV (V)	$\epsilon$ 1KHz	$\tan\delta$ (%)	$\eta_{10}$ Pa · s	Ratio $\eta_{10}/\eta_{50}$	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		Paste	Fired	
AP5346	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · PbO	510-5	73	400	490	-	>10 <sup>10</sup>	>500	8~12	<0.5	170	2.0	1.2	-	V	Green	Green	Excellent Water Resistance
AP5551	B <sub>2</sub> O <sub>3</sub> · ZnO · PbO	550-5	47	455	-	540	>10 <sup>10</sup>	>500	7~12	<0.5	150	2.1	2.0	-	D	Green	Green	High Strength
AP5840N	SiO <sub>2</sub> · PbO	550-5	61	460	560	-	-	-	-	-	80	1.4	2.0	-	V	Green	Green	For N2 atmosphere
AP5094D	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · Bi <sub>2</sub> O <sub>3</sub>	520-10	85	450	510	-	-	-	-	-	110	-	-	0.7	V	Yellow	Yellow	Excellent Acid Resistance
<b>5033NF1</b>	SiO <sub>2</sub> · ZnO · Bi <sub>2</sub> O <sub>3</sub>	580-10	90	450	565	600	-	-	-	-	100	1.4	-	1.9	D	Black	Black	Excellent Acid Resistance
<b>1096-P200</b>	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	400-15	120	355	405	465	-	-	-	-	200	3.5	-	1.0	D	White	White	-
<b>YPT531E</b>	Bi <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	590-30	77	500	590	-	-	-	11~13	-	100	-	-	2.5	V	Blue	Clear	High Refraction Index / Transparent
<b>YPT525G</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	580-30	72	474	585	-	-	-	-	-	100	-	-	2.9	V	White	Clear	Low $\epsilon$ / Transparent
<b>5102Y</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · R <sub>2</sub> O	850-60	28	495*	775	-	-	-	-	-	100	-	-	1.3	V	White	Clear	Excellent Acid & Heat Resistance
<b>200GF-P100</b>	SiO <sub>2</sub> · R <sub>2</sub> O · BaO	750-30	105	472	648	-	-	-	-	-	106	2.7	-	5.0	V	White	White	-
<b>1941B-P50</b>	BaO · SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub>	700-15	90	591	683	-	-	-	-	-	46	2.9	-	1.2	V	White	White	-
<b>SG354-P</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	700-10	107	567	681	-	-	-	-	-	40	-	-	2.2	V	White	White	-
<b>CM251-ZL-P70</b>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · MgO	850-60	108	662	757	891	-	-	-	-	75	1.3	-	10.0	D	White	White	-
<b>CM251-ZL5-P70</b>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · MgO	850-60	97	680	775	894	-	-	-	-	70	1.4	-	10.0	D	White	White	-
<b>CM251-H4-P70</b>	RO · B <sub>2</sub> O <sub>3</sub> · MgO	850-60	93	603	702	822	-	-	-	-	72	1.5	-	10.0	D	White	White	-
<b>DSG006La4-P70</b>	La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub> · ZnO	800-60	113	619	710	806	-	-	-	-	70	1.3	-	10.0	D	White	White	-
<b>DSG006-S6-P70</b>	ZnO · La <sub>2</sub> O <sub>3</sub> · B <sub>2</sub> O <sub>3</sub>	750-60	94	611	705	806	-	-	-	-	77	1.3	-	10.0	D	White	White	-
<b>HHR1010-P70</b>	SiO <sub>2</sub> · CaO · ZnO	1050-60	88	725	840	930	-	-	-	-	74	1.5	-	10.0	D	White	White	-

※*Italic* : Development products

\*:Tg from TMA curve IR : Insulation Resistance BV : Breakdown Voltage

V:Vitreous,D:Devitrifying

**Dielectric Cross over Paste for Hybrid IC**

Code	Glass Type	Firing Condition (°C-min)	$\alpha$ $\times 10^{-7}/^{\circ}\text{C}$	D T A Properties			Electrical Properties				Paste Viscosity		Particle Properties		Glass Characteristics	Color		Features
				Tg (°C)	Ts (°C)	Tc (°C)	IR ( $\Omega$ )	BV (V)	$\epsilon$ 1KHz	$\tan\delta$ (%)	$\eta_{10}$ Pa · s	Ratio $\eta_{10}/\eta_{50}$	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		Paste	Fired	
AP5576VE	SiO <sub>2</sub> · ZnO · RO	850-10	53	670	775	830	$>10^{12}$	$>1000$	9~14	$<0.2$	190	2.4	1.6	-	D	Orange	White	High Voltage Resistance
AP5577	SiO <sub>2</sub> · ZnO · RO	850-10	53	670	775	830	$>10^{12}$	$>1000$	10~16	$<0.3$	190	1.7	1.6	-	D	Blue	Blue	High Voltage Resistance
AP5700C	SiO <sub>2</sub> · ZnO · RO	850-10	72	680	815	890	$>10^{12}$	$>1000$	9~14	$<0.2$	200	2.3	1.6	-	P	Orange	White	High Voltage Resistance
AP5701C	SiO <sub>2</sub> · ZnO · RO	850-10	72	680	815	890	$>10^{12}$	$>1000$	9~14	$<0.2$	200	2.3	1.6	-	P	Blue	Blue	High Voltage Resistance

IR : Insulation Resistance BV : Breakdown Voltage

V:Vitreous,D:Devitrifying,P:Partially

### Dielectric Paste for Al<sub>2</sub>O<sub>3</sub> Substrate Glazing of Print Head

Code	Glass Type	Firing Condition (°C-min)	$\alpha$ $\times 10^{-7}/^{\circ}\text{C}$	D T A Properties			Surface Roughness			Paste Viscosity		Particle Properties		Glass Characteristics	Color		Features
				Tg (°C)	Ts (°C)	Tc (°C)	BV (V)	Ra ( $\mu\text{m}$ )	Rz ( $\mu\text{m}$ )	$\eta_{10}$ Pa · s	Ratio $\eta_{10}/\eta_{50}$	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		Paste	Fired	
AP5761D	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	1275-60	69	710	870	-	-	-	-	160	2.2	-	5.2	V	Orange	Clear	For Flat Glaze / Smooth
AP5762D	SiO <sub>2</sub> · RO	1270-30	65	765	925	-	-	-	-	160	1.9	-	5.0	V	Blue	Clear	For partial Glaze / Smooth

V:Vitreous

### Overcoat Glass Paste for Print Head

Code	Glass Type	Firing Condition (°C-min)	$\alpha$ $\times 10^{-7}/^{\circ}\text{C}$	D T A Properties			Surface Roughness			Paste Viscosity		Particle Properties		Glass Characteristics	Color		Features
				Tg (°C)	Ts (°C)	Tc (°C)	BV (V)	Ra ( $\mu\text{m}$ )	Rz ( $\mu\text{m}$ )	$\eta_{10}$ Pa · s	Ratio $\eta_{10}/\eta_{50}$	Average Particle( $\mu\text{m}$ )	D50 ( $\mu\text{m}$ )		Paste	Fired	
AP5349C	PbO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	810-10	62	460	-	-	>1500	-	<0.8	105	2.7	1.5	-	V	Gray	Brown	For Heater / Smooth & High Voltage Resistance
AP5316A	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	810-10	55	580	730	-	>1500	-	<1.5	85	1.6	-	1.5	V	Gray	Gray	For Heater / Smooth & High Voltage Resistance
<b>SATO-31H3</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	810-10	69	632	803	-	>1500	-	<0.8	120	2.0	-	-	V	Gray	Gray	For Heater / Smooth & High Voltage Resistance
<b>KATO-18R</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	810-10	69	638	794	-	-	<0.1	-	100	2.9	-	-	V	White	Clear	For Thermal Head / Smooth / Excellent light blockng
AP5564J	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · PbO	830-10	51	565 <sup>*1</sup>	670	-	-	<0.3	-	100	2.6	0.8	0.9	V	Orange	Clear	For Thermal Head / Smooth
AP5565K	SiO <sub>2</sub> · PbO	830-10	58	623 <sup>*1</sup>	678 <sup>*2</sup>	-	-	<0.3	-	130	3.1	0.7	-	V	Blue	Clear	For Thermal Head / Smooth
AP5568C	SiO <sub>2</sub> · PbO	830-10	59	555	-	-	-	<0.3	-	90	2.5	-	0.8	V	White	Clear	For Thermal Head / High Wear Resistance
AP5352C	PbO · B <sub>2</sub> O <sub>3</sub> · SiO <sub>2</sub>	810-10	63	455	-	-	-	<0.1	-	110	2.4	-	1.5	V	Black	Black	For Image Sensor / Excellent light blockng
<b>5317B1</b>	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · RO	850-10	45	577	734	-	-	-	<0.8	90	1.8	-	1.5	V	Gray	Gray	For AlN Top layer
AP5717B	SiO <sub>2</sub> · ZnO · RO	850-10	33	663	794	830	-	-	-	150	1.3	-	2.5	D	White	White	For AlN Bottom layer

※*Italic : Development products*

\*1 Tg from TMA curve

\*2:Ts from TMA curve

V:Vitreous,D:Devitrifying

**Low Temperature Sealing Glass Paste**

Code	Glass Type	Firing Condition (°C-min)	$\alpha$ $\times 10^{-7}/^{\circ}\text{C}$	D T A Properties			Electrical Properties	Paste Viscosity				D50 ( $\mu\text{m}$ )	Glass Characteristics	Color		Features
				Tg (°C)	Ts (°C)	Tc (°C)	VR ( $\Omega \cdot \text{cm}$ )	$\eta_{10}$ Pa · s	Ratio $\eta_{10}/\eta_{50}$	$\eta_{25}$ Pa · s	Ratio $\eta_{5}/\eta_{50}$			Paste	Fired	
AP4290D1	SiO <sub>2</sub> · B <sub>2</sub> O <sub>3</sub> · PbO	430-10	78	340	405	-	-	-	-	90	2.5	3.5	V	White	White	Under 500°C
AP4115AB	Bi <sub>2</sub> O <sub>3</sub> · ZnO	440-10	77	344	402	-	-	-	-	90	2.3	-	V	Yellow	Yellow	Under 500°C
<b><i>KFI0115B-P200</i></b>	Bi <sub>2</sub> O <sub>3</sub> · ZnO · B <sub>2</sub> O <sub>3</sub>	440-10	107	357	414	-	-	200	2.3	-	-	1.2	V	Yellow	Yellow	Under 500°C
<b><i>TNS062-ZC2-P150</i></b>	TeO <sub>2</sub> · V <sub>2</sub> O <sub>5</sub>	380-10	84	270	340	-	-	150	2.8	-	-	2.8	V	Brown	Brown	Under 400°C

※*Italic : Development products*

V:Vitreous