



POWDER GLASS GLASS PASTE

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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

R₂O : R₂ 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 Gravit | Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| ASF-102X | SiO ₂ · B ₂ O ₃ | 2.2 | 850-10 | 28 | 50-350 | - | - | 762 | - | - | 1.1 | V | Electronic parts |
| ASF-1094 | Bi ₂ O ₃ · B ₂ O ₃ · SiO ₂ | 5.4 | 550-10 | 79 | 50-350 | 466 | - | 526 | - | - | 0.8 | V | Electronic parts |
| ASF-1096 | Bi ₂ O ₃ · B ₂ O ₃ | 6.7 | 400-15 | 120 | 50-350 | 355 | - | 405 | 465 | - | 1.0 | D | Electronic parts |
| ASF-1097 | Bi ₂ O ₃ · B ₂ O ₃ · Al ₂ O ₃ | 5.2 | 600-15 | 70 | 50-350 | 520 | - | 605 | - | - | 2.3 | V | Electronic parts |
| ASF-1098 | Bi ₂ O ₃ · B ₂ O ₃ · ZnO | 5.5 | 600-10 | 54 | 50-350 | 441 | - | 517 | 535 | - | 3.0 | D | Electronic parts |
| ASF-1099 | ZnO · Bi ₂ O ₃ · B ₂ O ₃ | 4.7 | 600-10 | 42 | 50-350 | 475 | - | 516 | 562 | - | 3.5 | D | Electronic parts |
| ASF-1100 | Bi ₂ O ₃ · B ₂ O ₃ | 6.3 | 460-30 | 107 | 50-350 | 380 | - | 440 | 530 | - | 5.2 | D | Electronic parts |
| ASF-1100B | Bi ₂ O ₃ · B ₂ O ₃ | 6.3 | 460-30 | 107 | 50-350 | 382 | - | 439 | 520 | - | 1.1 | D | Electronic parts |
| ASF-1109 | Bi ₂ O ₃ · ZnO · B ₂ O ₃ | 5.1 | 580-5 | 65 | 50-350 | 461 | - | 537 | - | - | 2.8 | V | Electronic parts |
| ASF-1216 | PbO · SiO ₂ | 4.3 | 600-15 | 63 | 50-350 | 468 | - | 576 | - | - | 1.7 | V | Electronic parts |
| ASF-1290A4 | PbO · B ₂ O ₃ | 6.3 | 430-10 | 105 | 30-300 | 332 | - | 394 | - | - | 3.9 | V | Electronic parts |
| ASF-1317 | SiO ₂ · BaO · B ₂ O ₃ | 3.1 | 810-10 | 55 | 50-350 | 585 | - | 730 | - | - | 1.5 | V | Electronic parts |
| ASF-1330 | PbO · B ₂ O ₃ | 5.6 | 500-15 | 92 | 50-350 | 380 | - | 445 | - | 2.0 | 2.0 | V | Electronic parts |
| ASF-1370 | PbO · SiO ₂ · B ₂ O ₃ | 3.8 | 650-15 | 52 | 50-350 | 465 | - | 615 | - | 2.1 | 1.9 | V | Electronic parts |

※*Italic* : Development products

*V:Vitreous,D:Devitrifying

Powder Glass for Binder (2)

| Code | Glass Type | Specific Gravit | Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| ASF-1560 | SiO ₂ · ZnO · CaO | 3.3 | 850-15 | 73 | 50-350 | 670 | - | 780 | 815 | 1.7 | 2.2 | D | Electronic parts |
| ASF-1561 | SiO ₂ · ZnO · CaO | 3.4 | 850-10 | 75 | 50-350 | 640 | - | 750 | 892 | - | 3.5 | D | Electronic parts |
| ASF-1620B | ZnO · B ₂ O ₃ · SiO ₂ | 3.7 | 850-15 | 55 | 50-350 | 570 | - | 656 | 759 | - | 4.5 | D | Electronic parts |
| ASF-1700 | SiO ₂ · BaO · ZnO | 3.6 | 850-15 | 72 | 50-350 | 680 | - | 813 | 890 | 1.6 | 2.0 | D | Electronic parts |
| ASF-1702 | BaO · SiO ₂ · ZnO | 3.8 | 950-15 | 119 | 50-350 | 679 | - | 807 | 911 | - | 2.6 | D | Electronic parts |
| ASF-1717 | SiO ₂ · BaO · ZnO | 3.3 | 850-10 | 35 | 50-350 | 677 | - | 808 | 846 | - | 2.5 | D | Electronic parts |
| ASF-1761 | SiO ₂ · RO | 3.0 | 1000-15 | 69 | 50-350 | 710 | - | 870 | - | - | 5.2 | V | Electronic parts |
| ASF-1780 | SiO ₂ · B ₂ O ₃ · BaO | 2.5 | 850-15 | 52 | 50-350 | 538 | - | 783 | - | 3.1 | 4.9 | V | Electronic parts |
| ASF-1891 | ZnO · B ₂ O ₃ · SiO ₂ | 3.5 | 800-10 | 66 | 50-350 | 488 | - | 587 | 710 | - | 2.8 | D | Electronic parts |
| ASF-1891F | ZnO · B ₂ O ₃ · SiO ₂ | 3.5 | 800-10 | 63 | 50-350 | 495 | - | 589 | 707 | - | 1.5 | D | Electronic parts |
| ASF-1898B | BaO · B ₂ O ₃ · ZnO | 3.4 | 600-10 | 106 | 50-350 | 442 | - | 526 | 710 | - | 1.1 | D | Electronic parts |
| ASF-1930 | SiO ₂ · TiO ₂ · R ₂ O | 2.8 | 800-15 | 113 | 50-350 | 570 | - | 660 | 805 | - | 3.0 | D | Electronic parts |
| ASF-1939 | BaO · SiO ₂ · B ₂ O ₃ | 3.7 | 850-15 | 88 | 50-350 | 620 | - | 716 | not clear | - | 1.3 | D | Electronic parts |
| ASF-1941B | BaO · SiO ₂ · B ₂ O ₃ | 3.7 | 700-15 | 90 | 50-350 | 591 | - | 683 | - | - | 1.2 | V | Electronic parts |
| ASF-4001B | Bi ₂ O ₃ · ZnO · B ₂ O ₃ | 6.8 | 520-10 | 90 | 50-350 | 406 | - | 472 | - | - | 0.6 | V | Electronic parts |

※Italic : Development products

*V:Vitreous,D:Devitrifying

Powder Glass for Binder (3)

| Code | Glass Type | Specific Gravit | Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| <i>JP-1</i> | PbO · SiO ₂ | 3.5 | 865-30 | 40 | 50-600 | 637 | - | 829 | - | - | 4.0 | V | Electronic parts |
| <i>K-301</i> | RO · B ₂ O ₃ · SiO ₂ | 3.1 | - | 90 | 30-300 | 561 | 633 | 665 | > 800 | - | 7.0 | D | Electronic parts |
| <i>K-304</i> | RO · B ₂ O ₃ · SiO ₂ | 2.9 | 490-60 | 106 | 30-250 | 444 | 503 | 525 | 614 | - | 9.0 | D | Electronic parts |
| <i>K-807</i> | BaO · SiO ₂ · B ₂ O ₃ | 3.5 | - | 75 | 30-300 | 657 | 739 | 780 | - | - | 8.0 | V | Electronic parts |
| <i>K-808</i> | BaO · SiO ₂ · B ₂ O ₃ | 3.4 | - | 70 | 30-300 | 666 | 758 | 795 | - | - | 8.0 | V | Electronic parts |
| <i>K-835</i> | ZnO · B ₂ O ₃ | 3.8 | 680-10 | 35 | 50-350 | 545 | - | not clear | 680 | - | 7.0 | D | Electronic parts |
| KF9173 | Bi ₂ O ₃ · B ₂ O ₃ · ZnO | 6.4 | 520-10 | 98 | 30-300 | 403 | 459 | 480 | - | 3.5 | 11.0 | V | Electronic parts |
| <i>KP312</i> | SnO · P ₂ O ₅ | 3.8 | 430-10 | 128 | 30-250 | 280 | 328 | 352 | - | - | 9.0 | V | Electronic parts |
| LS-5-300M | SiO ₂ · BaO · Li ₂ O | 2.9 | 620-15 | 105 | 30-300 | 490 | 575 | 610 | 675 | - | 10.0 | D | Electronic parts |
| SK-231-300 | Bi ₂ O ₃ · BaO · B ₂ O ₃ | 5.1 | 620-15 | 84 | 30-300 | 491 | 559 | 580 | - | 4.0 | 5.8 | V | Electronic parts |
| <i>1991Y10</i> | SiO ₂ · R ₂ O · TiO ₂ | 2.8 | 600-10 | 150 | 50-350 | 410 | - | 529 | - | - | 4.5 | V | Electronic parts |
| <i>200GF</i> | SiO ₂ · R ₂ O · BaO | 2.5 | 750-30 | 105 | 50-300 | 472 | - | 648 | - | - | 5.0 | V | Electronic parts |

※Italic : Development products

*V:Vitreous,D:Devitrifying

Powder Glass for Low Temperature sealing

| Code | Glass Type | Specific Gravit | Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| ASF-1290A4 | PbO · B ₂ O ₃ | 6.3 | 430-10 | 105 | 30-300 | 332 | - | 394 | - | - | 3.9 | V | Stainless sealig |
| ASF-1898 | BaO · B ₂ O ₃ · ZnO | 3.4 | 600-10 | 106 | 50-350 | 433 | - | 527 | - | - | 4.5 | V | Seathed heaters |
| <i>FP-67</i> | SnO · P ₂ O ₅ | 3.6 | 480-10 | 79 | 30-250 | 285 | 357 | 390 | - | - | 20.0 | V | Soda-Lime Glass sealing |
| FP-74 | SnO · P ₂ O ₅ | 3.4 | 480-10 | 63 | 30-250 | 275 | 355 | 375 | - | 4.6 | 20.0 | V | Ceramics sealing |
| ASF-2511C | Bi ₂ O ₃ · ZnO | 6.4 | 500-10 | 82 | 30-300 | 353 | 398 | 425 | - | - | 8.0 | V | Soda-Lime Glass sealing |
| <i>KFI0115B</i> | Bi ₂ O ₃ · ZnO · B ₂ O ₃ | 7.4 | 470-10 | 107 | 30-300 | 357 | 400 | 414 | - | - | 1.2 | V | Stainless sealig |
| KF9173 | Bi ₂ O ₃ · B ₂ O ₃ · ZnO | 6.4 | 520-10 | 98 | 30-300 | 403 | 459 | 480 | - | 3.5 | 11.0 | V | Seathed heaters |
| <i>KP312</i> | SnO · P ₂ O ₅ | 3.8 | 430-10 | 128 | 30-250 | 280 | 328 | 352 | - | - | 9.0 | V | - |
| <i>KP312E</i> | SnO · P ₂ O ₅ | 3.5 | 430-10 | 71 | 30-250 | 280 | 344 | 398 | - | - | 20.0 | V | Ceramics sealing |
| <i>TNS062</i> | TeO ₂ · V ₂ O ₅ | 4.2 | 380-10 | 134 | 30-250 | 271 | - | 327 | - | - | 9.1 | V | Low temp sealing |
| <i>TNS062-ZB</i> | TeO ₂ · V ₂ O ₅ | 4.0 | 380-10 | 84 | 30-250 | 270 | - | 340 | - | - | 2.8 | V | Low temp sealing |
| <i>YFT-525E</i> | B ₂ O ₃ · SiO ₂ · ZnO | 2.5 | 580-10 | 72 | 50-350 | 471 | - | 586 | - | - | 3.0 | V | - |
| <i>YFT-531E</i> | Bi ₂ O ₃ · ZnO · B ₂ O ₃ | 4.8 | 590-10 | 76 | 50-350 | 493 | - | 589 | - | - | 2.7 | V | - |
| <i>1991Y10</i> | SiO ₂ · R ₂ O · TiO ₂ | 2.8 | 600-10 | 150 | 50-350 | 410 | - | 529 | - | - | 4.5 | V | Metal sealing |
| 7574 | ZnO · B ₂ O ₃ · SiO ₂ | 3.6 | 775-30 | 37 | 50-500 | 567 | 647 | 665 | - | 10.2 | 45.0 | D | AlN sealing |
| 9079-150 | SnO · P ₂ O ₅ | 3.8 | 480-10 | 122 | 50-250 | 287 | 344 | 362 | - | - | 13.0 | V | - |

※*Italic : Development products*

*V:Vitreous,D:Devitrifying

Powder Glass for heat resistance

| Code | Glass Type | ※1 Heat Resistance Temp. | *2 Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| <i>CM251-H4</i> | RO · B ₂ O ₃ · MgO | 900 | 850-60 | 93 | 50-350 | 603 | - | 702 | 822 | - | 10.0 | D | SOFC sealing |
| <i>CM251-ZL</i> | La ₂ O ₃ · B ₂ O ₃ · MgO | 900 | 850-60 | 108 | 50-350 | 662 | - | 757 | 891 | - | 10.0 | D | SOFC sealing |
| <i>CM251-ZL5</i> | La ₂ O ₃ · B ₂ O ₃ · MgO | 900 | 850-60 | 97 | 50-350 | 680 | - | 775 | 894 | - | 10.0 | D | SOFC sealing |
| <i>DSG006La4</i> | La ₂ O ₃ · B ₂ O ₃ · ZnO | 800 | 800-60 | 113 | 50-350 | 619 | - | 710 | 806 | - | 10.0 | D | SOFC sealing |
| <i>DSG006-S6</i> | ZnO · La ₂ O ₃ · B ₂ O ₃ | 800 | 750-60 | 94 | 50-350 | 611 | - | 705 | 806 | - | 10.0 | D | SOFC sealing |
| <i>ER001</i> | SiO ₂ · ZrO ₂ · R ₂ O | - | 900-60 | 66 | 50-350 | 687 | - | 893 | - | - | 7.0 | V | Microreactor sealing |
| <i>HHR0704-7</i> | SiO ₂ · ZnO · BaO | 700 | 950-60 | 45 | 50-350 | 741 | - | 931 | - | - | 7.0 | V | AlN sealing |
| <i>HHR0706</i> | ZnO · B ₂ O ₃ · SiO ₂ | 700 | 850-60 | 43 | 50-350 | 570 | - | 656 | 759 | - | 4.5 | D | AlN sealing |
| <i>HHR1010</i> | SiO ₂ · CaO · ZnO | 1000 | 1050-60 | 88 | 50-350 | 725 | - | 840 | 930 | - | 10.0 | D | SOFC sealing |

※*Italic : Development products* *1: Checked by TMA. *2: Lowest Crystallization temp. for Devitrifying glass.

*V:Vitreous,D:Devitrifying

Powder Glass for Glass-Ceramic Multilayer Substrate

| Code | Glass Type | Specific Gravit | Firing Condition (°C-min) | CTE(α) | | 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(μm) | D50 (μm) | | |
| ASF-102M | SiO ₂ · B ₂ O ₃ | 2.2 | 850-60 | 28 | 50-350 | - | - | 790 | - | - | 3.3 | V | Multilayer substrate |
| ASF-102X | SiO ₂ · B ₂ O ₃ | 2.2 | 850-60 | 28 | 50-350 | - | - | 762 | - | - | 1.1 | V | Multilayer substrate |
| ASF-102Y | SiO ₂ · B ₂ O ₃ | 2.2 | 850-60 | 28 | 50-350 | - | - | 775 | - | - | 1.3 | V | Multilayer substrate |
| <i>102-0.3</i> | SiO ₂ · B ₂ O ₃ | 2.2 | 850-60 | 24 | 50-350 | - | - | 729 | - | - | 0.3 | V | Multilayer substrate |
| ASF-1700F | SiO ₂ · BaO · ZnO | 3.6 | 850-15 | 67 | 50-350 | 671 | - | 810 | 923 | - | 1.8 | D | Multilayer substrate |
| <i>DL828</i> | SiO ₂ · B ₂ O ₃ · Al ₂ O ₃ | 2.3 | 900-60 | 36 | 50-350 | - | - | 860 | - | - | 1.2 | V | Multilayer substrate |
| FF-201 | SiO ₂ · Al ₂ O ₃ · MgO | 2.6 | 900-30 | 50 | 40-750 | 720 | 840 | 900 | 1040 | - | 17.0 | D | Multilayer substrate |
| <i>FF-202</i> | RO · SiO ₂ · MgO | 3.5 | 900-20 | 100 | 30-300 | 715 | - | 840 | 935 | - | 4.5 | D | Multilayer substrate |
| <i>ZX-1</i> | SiO ₂ · MgO · Al ₂ O ₃ | 2.9 | 900-60 | 80 | 50-350 | 750 | - | 872 | 947 | - | 2.7 | D | Multilayer substrate |

※*Italic : Development products*

*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 Hybrid IC

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | | | | Paste Viscosity | | Particle Properties | | Glass Characteristics | Color | | Features |
|----------------|---|------------------------------|---|------------------|------------|------------|-----------------------|-----------|--------------------|---------------------|-----------------------|--------------------------------|--------------------------------------|--------------------------|-----------------------|--------|--------|----------------------------|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | IR (Ω) | BV (V) | ϵ 1KHz | $\tan\delta$ (%) | η_{10} Pa · s | Ratio η_{10}/η_{50} | Average Particle(μm) | D50 (μm) | | Paste | Fired | |
| AP5346 | SiO ₂ · B ₂ O ₃ · PbO | 510-5 | 73 | 400 | 490 | - | $>10^{10}$ | >500 | 8~12 | <0.5 | 170 | 2.0 | 1.2 | - | V | Green | Green | Excellent Water Resistance |
| AP5550 | B ₂ O ₃ · ZnO · PbO | 550-5 | 47 | 455 | - | 540 | $>10^{10}$ | >500 | 7~12 | <0.5 | 150 | 2.1 | 2.0 | - | D | White | White | High Stregth |
| AP5551 | B ₂ O ₃ · ZnO · PbO | 550-5 | 47 | 455 | - | 540 | $>10^{10}$ | >500 | 7~12 | <0.5 | 150 | 2.1 | 2.0 | - | D | Green | Green | High Stregth |
| AP5840N | SiO ₂ · PbO | 550-5 | 61 | 460 | 560 | - | - | - | - | - | 80 | 1.4 | 2.0 | - | V | Green | Green | For N2 atomosphere |
| AP5094D | SiO ₂ · B ₂ O ₃ · Bi ₂ O ₃ | 520-10 | 85 | 450 | 510 | - | - | - | - | - | 110 | - | - | 0.7 | V | Yellow | Yellow | Excellent Acid Resistance |
| 5033NF1 | SiO ₂ · ZnO · Bi ₂ O ₃ | 580-10 | 90 | 450 | 565 | 600 | - | - | - | - | 100 | 1.4 | - | 1.9 | D | Black | Black | Excellent Acid Resistance |

※*Italic* : Development products

IR : Insulation Resistance BV : Breakdown Voltage

*V:Vitreous,D:Devitrifying

Dielectric Cross over Paste for Hybrid IC

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | | | | Paste Viscosity | | Particle Properties | | Glass Characteristics | Color | | Features |
|----------|-----------------------------|------------------------------|---|------------------|------------|------------|-----------------------|-----------|--------------------|---------------------|-----------------------|--------------------------------|--------------------------------------|--------------------------|-----------------------|--------|-------|-------------------------|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | IR (Ω) | BV (V) | ϵ 1KHz | $\tan\delta$ (%) | η_{10} Pa · s | Ratio η_{10}/η_{50} | Average Particle(μm) | D50 (μm) | | Paste | Fired | |
| AP5576VE | SiO ₂ · ZnO · RO | 850-10 | 53 | 670 | 785 | 830 | $>10^{12}$ | >1000 | 9~14 | <0.2 | 190 | 2.4 | 1.6 | - | D | Orange | White | High Voltage Resistance |
| AP5577 | SiO ₂ · ZnO · RO | 850-10 | 53 | 670 | 785 | 830 | $>10^{12}$ | >1000 | 10~16 | <0.3 | 190 | 1.7 | 1.6 | - | D | Blue | Blue | High Voltage Resistance |
| AP5578 | SiO ₂ · ZnO · RO | 850-10 | 53 | 670 | 785 | 830 | $>10^{12}$ | >1000 | 12~17 | | 190 | 1.8 | 1.6 | - | D | Black | Black | High Voltage Resistance |
| AP5700C | SiO ₂ · 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 ₂ · 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 Al2O3 Substrate Glazing of Print Head

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

Overcoat Glass Paste for Print Head

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | Paste Viscosity | | Surface Roughness | | Particle Properties | | Glass Characteristics | Color | | Features |
|------------------------------------|--|------------------------------|---|-------------------|-------------------|------------|-----------------------|-----------------------|--------------------------------|-------------------------|-------------------------|--------------------------------------|--------------------------|-----------------------|--------|-------|---|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | BV (V) | η_{10} Pa · s | Ratio η_{10}/η_{50} | Ra (μm) | Rz (μm) | Average Particle(μm) | D50 (μm) | | Paste | Fired | |
| AP5349 | PbO · B ₂ O ₃ · SiO ₂ | 810-10 | 62 | 460 | - | - | > 1500 | 105 | 2.7 | - | <0.8 | 1.5 | - | V | Gray | Brown | For Heater / Smooth & High Voltage Resistance |
| <i>SATO-31H</i> | SiO ₂ · B ₂ O ₃ · RO | 810-10 | 69.13 | 631.5 | 802.5 | - | > 1500 | 100 | 2 | - | <0.8 | - | 1.2 | V | Gray | Gray | For Heater / Smooth & High Voltage Resistance |
| AP5316A | SiO ₂ · B ₂ O ₃ · RO | 810-10 | 55 | 580 | 730 | - | > 1500 | 85 | 1.6 | - | <1.5 | - | 1.5 | V | Gray | Gray | For Heater / Smooth & High Voltage Resistance |
| AP5564J | SiO ₂ · B ₂ O ₃ · PbO | 830-10 | 51 | 565 ^{*1} | 670 | - | - | 100 | 2.6 | <0.3 | - | 0.8 | 0.9 | V | Orange | Clear | For Thermal Head / Smooth |
| <i>KATO-18R</i> | SiO ₂ · B ₂ O ₃ · RO | 810-10 | 69 | 637.8 | 794 | - | - | 100 | 2.9 | <0.1 | - | - | - | V | White | Clear | For Thermal Head / Smooth / Excellent light blockng |
| AP5565K | SiO ₂ · PbO | 830-10 | 58 | 623 ^{*1} | 678 ^{*2} | - | - | 130 | 3.1 | <0.3 | - | 0.7 | - | V | Blue | Clear | For Thermal Head / Smooth |
| AP5568C | SiO ₂ · PbO | 830-10 | 59 | 555 | - | - | - | 90 | 2.5 | <0.3 | - | - | 0.8 | V | White | Clear | For Thermal Head / High Wear Resistance |
| AP5352C | PbO · B ₂ O ₃ · SiO ₂ | 810-10 | 63 | 455 | - | - | - | 110 | 2.4 | <0.1 | - | - | 1.5 | V | Black | Black | For Image Sensor / Excellent light blockng |
| <i>5317B1</i> ^{*3} | SiO ₂ · B ₂ O ₃ · RO | 850-10 | 45 | 577 | 734 | - | - | 90 | 1.8 | - | <0.8 | - | 1.5 | V | Gray | Gray | For AlN Top layer |
| AP5717 ^{*3} | SiO ₂ · 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

Transparent Overcoat Glass Paste

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | | Paste Viscosity | | D50 (μm) | Glass Characteristic cs | Color | | Features |
|----------------|---|------------------------------|---|-------------------|------------|------------|-----------------------|---------------------|-----------------------|--------------------------------|--------------------------|----------------------------|-------|-------|-------------------------------------|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | ϵ 1kHz | $\tan\delta$ (%) | η_{10} Pa · s | Ratio η_{10}/η_{50} | | | Paste | Fired | |
| 5102Y | $\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot \text{R}_2\text{O}$ | 850-60 | 28 | 495 ^{*1} | 775 | | - | - | 100 | - | 1.3 | V | White | Clear | Excellent Acid & Heat Resistance |
| YPT525 | $\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot \text{ZnO}$ | 580-30 | 72 | 470 | 580 | | 5~7 | - | 100 | - | 2.5 | V | Blue | Clear | Low ϵ / Transparent |
| YPT531E | $\text{Bi}_2\text{O}_3 \cdot \text{B}_2\text{O}_3 \cdot \text{ZnO}$ | 590-30 | 77 | 500 | 590 | | 11~13 | - | 100 | - | 2.5 | V | Blue | Clear | High Refraction Index / Transparent |

※*Italic* : Development products

*1 Tg from TMA curve

*V:Vitreous

High Reflective Overcoat Glass Paste for Al2O3 Substrate

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | | Paste Viscosity | | D50 (μm) | Glass Characteristic cs | Color | | Features |
|--------------|--|------------------------------|---|-------------------|------------|------------|-----------------------|---------------------|-----------------------|--------------------------------|--------------------------|----------------------------|-------|-------|----------------------------------|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | ϵ 1kHz | $\tan\delta$ (%) | η_{10} Pa · s | Ratio η_{10}/η_{50} | | | Paste | Fired | |
| 5102Y | $\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot \text{R}_2\text{O}$ | 850-60 | 28 | 495 ^{*1} | 775 | | - | - | 100 | - | 1.3 | V | White | Clear | Excellent Acid & Heat Resistance |

※*Italic* : Development products

*1 Tg from TMA curve

*V:Vitreous

Low temperature sealing Glass Paste

| Code | Glass Type | Firing Condition (°C-min) | α $\times 10^{-7}/^{\circ}\text{C}$ | D T A Properties | | | Electrical Properties | | Paste Viscosity | | D50 (μm) | Glass Characteristic cs | Color | | Features |
|------------------------|---|------------------------------|---|------------------|------------|------------|-----------------------|---------------------|-----------------------|--------------------------------|--------------------------|----------------------------|--------|--------|-------------|
| | | | | Tg (°C) | Ts (°C) | Tc (°C) | ϵ 1kHz | $\tan\delta$ (%) | η_{10} Pa · s | Ratio η_{10}/η_{50} | | | Paste | Fired | |
| AP4290D1 | $\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot \text{PbO}$ | 430-10 | 78 | 340 | 405 | - | - | - | 90 ^{*1} | 2.5 | 3.5 | V | White | White | Under 500°C |
| AP4115AB | $\text{Bi}_2\text{O}_3 \cdot \text{ZnO}$ | 440-10 | 77 | 344 | 402 | - | - | - | 90 ^{*1} | 2.3 | - | V | Yellow | Yellow | Under 500°C |
| KFI0115B-P200 | $\text{Bi}_2\text{O}_3 \cdot \text{ZnO} \cdot \text{B}_2\text{O}_3$ | 440-10 | 107 | 357 | 414 | - | - | - | 200 | 2.3 | 1.2 | V | Yellow | Yellow | Under 500°C |
| TNS062-Z27-KN01 | $\text{TeO}_2 \cdot \text{V}_2\text{O}_5$ | 380-10 | 80 | 270 | 325 | - | - | - | 140 | 2.6 | - | V | Brown | Brown | Under 400°C |

※*Italic* : Development products

*1 : Viscosity of η_{25}

*V:Vitreous