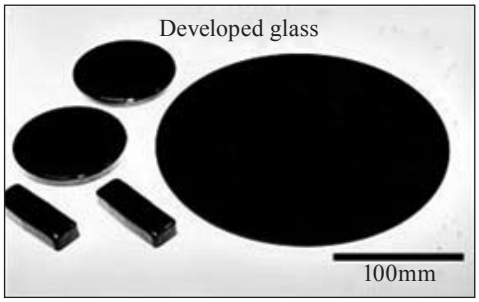
Pb-free Vanadium-based Low-Melting Glass Paste: VS-1026

Technical background

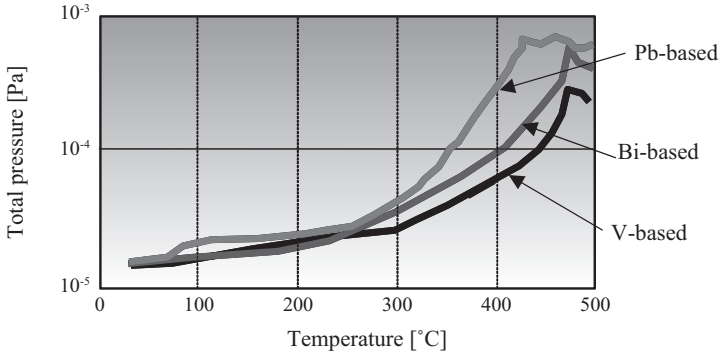
Until recently, lead-based low-melting glass had been used in sealing and coating of low temperature glass. But due to heightened environmental awareness in recent years and other factors, bismuth-based low-melting glass which does not contain harmful lead (Pb) is now used in some products in conformance with the RoHS Directive. However, because bismuth (Bi) is mainly extracted as a byproduct of lead and is a scarce resource with limited reserves, securing a stable supply is a concern. Therefore, Hitachi Powdered Metals and Hitachi, Ltd. jointly developed and commercialized a Pb-free vanadium-based low-melting glass paste composed mainly of vanadium (V), which is an abundant resource with a stable supply.

Features of the new product

(1) Enables sealing at coating temperatures under 450°C, which is lower than the conventional Bi-based product.
(2) Has excellent acid resistance in comparison with the Pb- and Bi-based products.
(3) Because the specific gravity of the V-based product is approximately half that of the Pb- and Bi-based products, convenience in use is superior.
(4) The developed product has a semiconducting electron transmission property.
(5) In comparison with the Pb- and Bi-based products, the amount of gas emissions during firing is small.
(6) The developed product has strong adhesion. Adhesive strength approximately 1.5 times that of the Pb-based product can be obtained.



	New product	Conventional products	
	Vanadium-based	Bismuth-based	Lead-based
Conforms to RoHS Directive	Yes	Yes	No
Glass composition system	V-P-O	Bi-B-O	Pb-B-O
Color	Black	Yellow / green	Gray
Sealing/coating temperature [°C]	Over 420°C	Over 450°C	Over 400°C
Acid resistance: Weight decrease [%] (5% nitric acid solution: immersion for 5min at 50°C)	1	4	30
Specific gravity of paste	2–3	5–7	6–8
Specific resistance [Ω·cm]	10^{2-10} (electron transmission property)	More than 10^{12} (insulating property)	More than 10^{12} (insulating property)



Gas emission properties of coating films after firing at 450°C

Examples of applicable products

· Low temperature sealing of thin panel displays, etc.
· Bonding of glasses and ceramics
· Anti-static coating

Other features

Product specifications, including the thermal expansion coefficient, particle size, viscosity, etc., can be customized depending on the use conditions.