FK4804: Glass joining and encapsulation paste for Al_2O_3 substrates

Fraunhofer IKTS

The glass paste FK4804 has been developed for the joining of Alumina materials at firing temperatures of 850 °C. It can also be used as a protective layer on thick-film resistors of the FK9100M resistor paste series to prevent resistor drift caused by environmental influences such as high humidity or light mechanical abrasion.

The paste is applied by screen printing and must be fired in air – usually in a belt furnace – to form a dense glaze layer. To produce higher layer thicknesses and thus higher breakdown voltages, the paste should be processed in several separate screen-printing and firing steps.

Processing

Substrates
The specifications stated are based on samples screen printed onto CeramTec ceramic (Rubalit 708S, asfired). Substrates with other surface qualities or from other suppliers may result in variations of performance of the properties.

Screen printing
In order to achieve the recommended layer thickness of 20 µm fired, wet layer thicknesses of 55 to 60 µm should be built up in two screen printing steps using a 200-mesh stainless steel screen with a wire diameter of 40 µm and an emulsion thickness of 25 µm (10-12 µm EOM).

Levelling
The screen printed film should level for 10±2 minutes at room temperature (22 to 25 °C).

Drying
After leveling, the films are dried at 150 °C for 15 minutes in a well ventilated drying furnace. A conveyor dryer can also be used.

Firing
The films should be fired in air at a peak temperature of 850 °C, a dwell time of 10 minutes and a total cycle time of 30 minutes in a belt furnace.

Storage
The paste should be stored at 4 to 10 °C. This guarantees a high paste viscosity and prevents the solids from settling. The jar must remain tightly closed during storage. To prevent condensation of air humidity on the paste, the jar must not be opened until the contents have reached room temperature. Before using the paste, it must be sufficiently homogenized, for example by stirring it with a spatula.

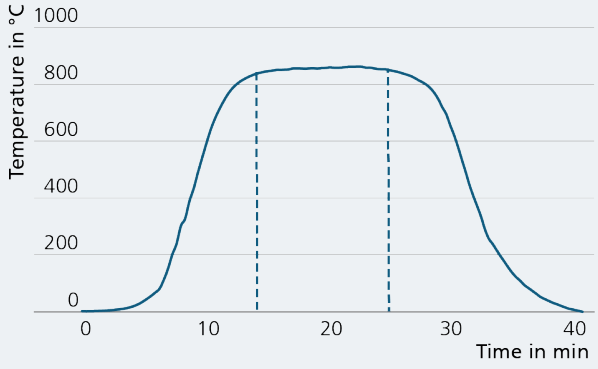
Safety notice
For safe handling and storage, also observe the advice of current material safety data sheets.

Quality requirements
Each delivery will be supplied with Certificate of Analysis (CoA). The paste meets all requirements of RoHS III (regulation 2015/863/EC) and REACH (regulation (EC) 1907/2006).

Instead of an expiration date, after which an expired paste would have to be disposed of regardless of its condition, it is provided with a retest date. The certified values of the paste are valid for six months from the date of shipment of the unopened jars. Prolonged storage may result in segregation of the solids. Then the paste should be mixed thoroughly before further use. After the retest date the customer can decide whether the product needs to be retested to recheck the parameters for further application. The test conditions are given in point 2 to compare the results with CoA.

Miscellaneous
The current technical specifications are published on our website www.ikts.fraunhofer.de.

Firing profile



Firing profile: 30'cycle time, peak 850 °C, dwell time 10 min

For more information please turn the page.

Technical specifications

Parameter	Unit	Value
Viscosity[1]	Pa·s	75…175
Color	—	Green
Fired film surface	—	Smooth, greenish-transparent film
Resistance drift[2]	%	TBD
Breakdown voltage[3]	kV/mm	TBD
Fired film thickness[4]	µm	> 20
Coverage[5]	cm²/g	125±10

[1] Brookfield viscometer HB with spindle/cup combination SC4-14/-6RP(Y) at n=10 rpm and 25±0.2 °C.
[2] Calculated for 200 squares resistors with a line width of 500 µm of FK9115 before and after encapsulation with FK4804.
[3] Measured at minimum 12 samples up to 1000 V; mean value of all Voltages before breakdown occurs.
[4] Double screen printed, post-firing films.
[5] Calculated area that can be printed with one gram paste in the recommended thickness.

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