Heraeus

Photo-Definable Materials

KQ500

Etchable Gold Conductor

Description:
KQ500 is a cadmium free, gold conductor paste developed for producing ultra-high density interconnections using a combination of screen printing and etching. This material uses the very latest developments in sub-micron gold powder technology in combination with a special printing vehicle to produce extremely dense fired films with very smooth fired finishes. These properties enable the production of conductor geometries as fine as 10 microns (0.4 mils).

- **Key Benefits:**
  - High conductivity
  - Precise edge acuity
  - Smooth surface
  - Excellent bondability
  - Cadmium free

- **Typical Paste Properties:**

Fineness of grind (FOG):
0.5 to 1.0 micron (main break)

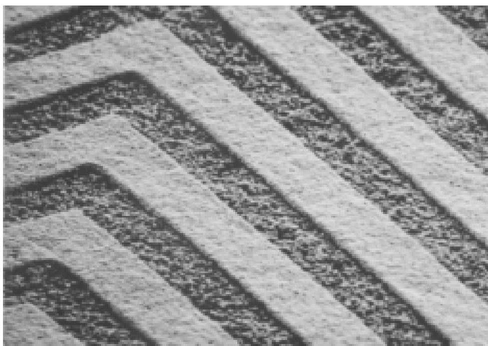
Coverage:
One Print: 140-150 cm^2/gm at recommended @ x thickness
Two Prints: 70-75 cm^2/gm at recommended @ y thickness

Viscosity:
35 - 65 kcps, Haake C-20, 1° Cone @ 30 sec^{-1}

% Solids:
83.0 ± 1.0%

Thinner:
V-500

Photomicrograph of 50 micron lines on 96% alumina at 150X



- **Typical Fired Properties:**

Lines/Spaces Resolution:
25 micron lines and spaces
(10 micron lines and 15 micron spaces possible on suitable substrates using optimized processing conditions)

Fired Thickness:
4 to 5 microns (recommended)
10 microns (maximum)

Fired Surface Finish:
R_a < 0.4 microns on 96% alumina with surface finish of 0.6 microns.

Resistivity:
< 3.0 milliohms/square
at 10 microns fired film thickness

Gold Wire Bondability:
1.0 mil Au Wire, 99.99% Au, Elongation 3-5%
6 x 6 mil pad on 96% alumina
Initial: > 8 grams
100 Hours at 150°C: > 8 grams
* **Note:** All failures were wire breaks

Gold Silicon Eutectic Bonding:
Excellent bonding of die shear on die
Adhesion > 2.2 lbs (0.5 kg)
Low spread of eutectic
X-ray inspection showed no voiding

Gold Tin Eutectic Bonding:
Excellent bonding of die shear and die
Performed under N_2 and forming gas covers
Adhesion > 4.5 lbs (1 kg)

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- **Recommended Processing Guidelines:**
  (For more detailed information, see document entitled, "Processing Guidelines for KQ500", AN# KQ001.)

Thinning:
To achieve recommended thickness, KQ500 should be thinned 10% by weight with V-500 prior to printing.
It is strongly recommended that you thin only as much gold as needed for a given print run.
Thinned gold should be stored on jar rollers whenever possible to prevent separation during storage.

Printing:
400 mesh screen, 0.3 mil emulsion,
0.9 mil wire, 45° bias
Print Speed: 6-7 inches per second
Print Sequence: Flood/Print mode recommended

Drying:
Allow paste to level for 10 minutes before drying.
Dry at 150°C for10 minutes.

Firing:
750-850°C peak temperature
10 minutes at peak
Total cycle time of 45 - 60 minutes. Good burnout and cleanliness vital.

Film Thickness:
Fired: 4-5 microns (two individually printed and fired layers)

Photoresist Application:
AZ P4400 positive photoresist or equivalent.
Static dispense used while part is stationary.
Use a spread speed of 600 rpm for 10 seconds for a uniform layer of photoresist.
Spin photoresist at 2800 rpm for 20 seconds.
Soft bake the photoresist for 3 minutes, 20 seconds at 110°C on hot plate or in box oven.

Exposure:
Use positive photo mask in mask aligner.
Level substrate, align the part and expose using soft contact mode.
Use UV light source with a usable wave length of 350 to 450 nm.
Use sufficient exposure time to deliver 400mJ/cm^2 of energy.

Development:
AZ 400K developer recommended.
Option 1: Immerse part in a bubble developing tank for 2.5 minutes.
Option 2: Agitate part slowly in beaker of swirling developer at 20-25°C for 2 minutes.
Rinse with DI water.

Etching:
Use standard thin film gold etchant solution (iodine/potassium iodide solution).
Best results achieved with spray etcher at 35-50°C.
Suspend part in the spray for approximately 2-4 minutes.
Etching time varies by gold thickness and strength of etching solution.

Rinse with DI water.

Remove the remaining resist by spraying
part with acetone or recommended stripper for the
photoresist used. Clean surface thoroughly to remove
residue.
For optimum cleanliness, refire the parts
at 700 - 850°C, 10 minutes at peak temperature.

Storage:

Slow roll thinned gold at 10-30°C for larger thinned
lots.
DO NOT REFRIGERATE
Spatulate well before using.

Warranty:

Material guaranteed to meet specifications
for 6 months from date of shipment

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The descriptions and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to date on the date this document was printed (latest versions can always be supplied upon request). Although the data is considered accurate, we cannot guarantee accuracy, the results obtained from its use, or any patent infringement resulting from its use (unless this is contractually and explicitly agreed in writing, in advance). The data is supplied on the condition that the user shall conduct tests to determine materials suitability for a particular application.

Americas
Heraeus Materials Technology LLC
Thick Film Materials Division
24 Union Hill Road
West Conshohocken, PA 19428
USA
Phone: +1 (610) 825-6050
E-Mail: techservice.hcd@heraeus.com
Internet: www.thickfilm.net

Europe
W.C. Heraeus GmbH
Thick Film Materials Division
Heraeusstr. 12-14
63450 Hanau
Germany
Phone: +49 (6181) 35-5466
E-mail: th-info@heraeus.com
Internet: www.heraeus-thickfilm.com

Asia
Heraeus Materials Technology
Shanghai Ltd.
No. 1 Guang Zhong Road
Zhuanqiao Town, Minhang District
Shanghai 201108
People’s Republic of China
Phone: + 86 (21) 3357-5688
E-Mail: th.hmts@heraeus.com
Internet: www.heraeus-thickfilm.com