

## Technical Information

# 5651 Lead-Free 500°C Overglaze

The 5651 low temperature glaze was developed to eliminate a major source of lead from electronic circuits. It is a direct replacement for most Pb-containing overglazes currently used for the encapsulation of resistors and hybrid circuitry. Glazing with 5651 generally results in less than 3% shift in the value of most thick film resistors. The 5651 composition does not contain

cadmium, lead, or highly toxic organic solvents. Key features include:

- Cd-Free, Pb-Free Composition
- Fast Laser Trimming
- Excellent hermeticity.
- Compatibility with most resistor systems.

### TYPICAL FIRED FILM CHARACTERISTICS<sup>(1)</sup>

<b>Color</b>	Green
<b>Firing Temperature</b>	500°C - 525°C
<b>Delta R<sup>(2)</sup></b>	< 5%

(1) Typical properties are based on testing of several batches under various processing conditions. They are not intended as specification limits.

(2) The shift resistance of Koartan 7600 and most other commercial resistor systems.

### COMPOSITION PROPERTIES

**Viscosity:** 130 ± 30 Kcps, when measured with Brookfield HBT, Spindle #14, utility cup, 10 rpm, 25°C.

**Specific Gravity:** 1.8 - 2.4 g/cm<sup>3</sup>

**Recommended Thinner:** KOARTAN A-1039

## RECOMMENDED PROCESSING PROCEDURE

**Printing:** Printing with 250 mesh stainless steel screen using 10-15  $\mu\text{m}$  emulsion and 45 degree angle is recommended. Other mesh counts, 200-325, and emulsion thicknesses, 5-25  $\mu\text{m}$ , may be used for special applications.

Coverage is approximately 120  $\text{cm}^2$  per layer, when utilizing 250 mesh screen and a wet print thickness of about 35  $\mu\text{m}$ .

**Drying:** Wet prints should be allowed to level for 5-10 minutes prior to drying. Dry for 10-15 minutes in a convection oven or belt dryer at 125°C-150°C.

**Firing:** Firing in air using a belt furnace and a 22-40 minute profile, with 10 minutes at a peak temperature of 500°C-510°C or 3 minutes at a peak temperature of 525°C-530°C, is recommended. Air flow rates must be optimized to ensure that the products of binder burn-off discharge properly and create a fully oxidizing atmosphere in the muffle.

**Application Notes:** A thin layer of 5650 overglaze is recommended for most applications requiring circuit protection from the environment.

For encapsulation of small thick film capacitors two layers of 5651 are recommended. For larger capacitors, or dielectrics with large TCE mismatch to alumina substrate a special buffer material

5651H may be required prior to the application of the 5651. Please consult Koartan's technical staff for your particular application.

**Storage and Shelf Life:** Store in tightly capped containers at room temperature. Shelf life is 6 months for unopened jars. Thorough mixing of the paste before each use is recommended. Under ordinary conditions of storage and use the product should not require thinning. However, solvent loss during extended printing runs may be replaced by incorporating up to 0.5% of Koartan A-1039 thinner.