

PURITY REQUIREMENTS FOR ADHESIVES IN CONTACT WITH GLAST DETECTORS

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- I found no standard for purity of semiconductor packaging materials but many references to the need for low ion content.
- The literature and “semiconductor material” data sheets generally agree on an acceptable ion content on the ppm level.
- Ions mentioned are: Halide (Cl-, Br-, etc.)
Alkali (Na+, K+, etc.)
Hydrogen Sulfide (H₂S)
Sulfur Dioxide (SO₂)

WHAT ARE THE ISSUES?

1. Mobile ions migrate to form surface charge on insulators which causes parasitic gates (not permanent).
2. Galvanic cells are created causing corrosion.
3. Electrolytic conduction (metal migration) causing shorts.

****ALL THESE EFFECTS REQUIRE MOISTURE****

****EFFECTS ARE ACCELERATED BY TEMPERATURE****

****NO INDICATION OF MIGRATION THROUGH PASSIVATION
AT GLAST OPERATING TEMPERATURES****

- The real issue is moisture trapping and condensation during manufacturing, storage, and operation of GLAST.
- Compared to most semiconductor packages, GLAST components will experience a very dry and stable temperature environment.
- Material purity requirements are probably not as strict as normal chip packages.

PROPOSAL:

1. Require adhesives to have “high purity” and ion content below 20ppm for Halide ions, and below 5ppm for Alkali ions. (From Epo-Tek Data sheets)
2. Require dry (N₂) storage of all tray parts and possible drying (vacuum oven) before various module assembly steps.
3. Test all adhesives with detectors in long term setup (many years). Our setup is almost operational and can test 8 detectors simultaneously.

REFERENCES:

1. Tummala, Rymaszewski, Klopfenstein, “Microelectronics Packaging Handbook, part II”, Chapman & Hall, New York, 1997
2. Lau, Wong, Prince, Nakayama, “Electronic Packaging: Design, Materials, Process, and Reliability”, McGraw-Hill, 1998
3. Epoxy Technology Inc. 1998 catalog