

Long Term Storage of Ormet Interface Materials

Task Summary: Evaluate the differences between Ormet paste storage in a freezer over various lengths of time as compared to fresh paste. Determine if container size or type affects the paste quality and characteristics over time. Report on the suitability of current conditions, including recommendations for temperature and humidity.

Background: Ormet conductive compound technologies involve complex reactions of copper, alloys, epoxies and organic vehicles. For industrial applications, it is necessary to assure these reactions occur during the installation process after the materials has been fabricated, shipped to the fabricator, reacted in the process and finally becoming stable in the electronic assembly. Cold shipping and storage is recommended for all Ormet pastes and the suitability of these recommendations is evaluated in this task. Some changes in the paste have been observed by the fabricators of the electronic assemblies and therefore the stability of the stored paste is of concern.

Standard tests for evaluation of installation and reaction of Ormet materials have evolved over the years. Prior to 2006 and regardless of application, all Ormet products were evaluated by mesh screen printing various sized traces on an FR-4 or solder mask substrate. The printed Ormet material was reacted in a vapor phase chamber at 215 degrees Celsius for 60-120 seconds. Then the direct current resistance (DCR) was measured with an ohmmeter. The size and shape of the trace was measured and a bulk resistivity was calculated. This method is satisfactory for Ormet products used in mesh screen printing of traces and subsequent reaction in a vapor phase chamber, but for Z-axis interconnect products, this methods was problematic and was changed in 2006.

Currently, Ormet products used in Z-axis interconnect are evaluated with a “trench” substrate that simulates a blind via configurations. The trenches represent widths between 8 to 20 mils and 33 microns deep. The trenches provides for a “trace” of sufficient length to achieve an accurate measurable DCR of 10 to 20 ohms. The trench in the substrate is created in liquid photo imaging (LPI) epoxy to simulate a blind via hole. This trench substrate features both a copper plane and FR-4 in the bottom of the trench. Only data from those trenches with FR-4 at the bottom are included in this task.

Purpose: The purpose is to evaluate the adequacy of the current paste storage requirements and make further recommendation, as necessary.

Scope: Ormet product 7001 was evaluated with methods consistent with Z-axis interconnect reactions.

Activities: Ormet product #7001 has been manufactured since 1999 and therefore there is substantial data and information characterizing this product. This historical information and recent evaluations of retained samples of these lots were used in this task to determine the long term cold storage behavior of this product. Jar sizes have changed over the years. The sizes are 2, 4, 6 and 8 fluid ounces Nalgene wide-mouth jars and lids.

Only the trench substrate test cards were used for this task. This test platform gives electrical resistance of the reacted conductive compound and also demonstrates viscosity and flow characteristics of the paste. The viscosity must be within applicable range to properly fill the trenches. Viscosity was not measured as part to this task because viscosity was varied by customer and application, and not part of the evaluation done at the time of fabrication. Furthermore, viscosity changes with time, temperature and processing have been examined in other tests. However, flow characteristics for each of the sample lots proved satisfactory for fill.

Results: Error! Not a valid link.

Test results show bulk resistivities between 34 and 56 uohm*cm for all samples tested. The Ormet specification is 100 uohm*cm MAX. All resistivities are well within this specification.

The measured temperature in the storage freezer was -22 to -28 degrees Celsius against the -10 degree specification. The freezer must be free from excessive moisture and humidity. Condensation caused by cold jars remove from the freezer should be completely cleared before opening the lids of the jars. Opening of the jars should only be done after the jar and paste have stabilized at room temperature to avoid condensation in the paste.

Conclusion: Ormet product 7001 can be stored at -10 degrees Celsius MAX for many years without affecting the conductivity, filling performance, reaction performance or the original characteristics applicable for Z-axis interconnects. The paste can be installed in test boards and reacted with consistent results.

The size of the jars used for packaging and storage is independent of the time in storage. Currently, this product is packaged in the 2 ounce wide-mouth jars which are preferred by some customers. Smaller jars, 1 fluid ounce and 100 grams, are also available on request.



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