

The Use of Graphene to Replace Silver in Electrically Conductive Adhesives - A Study on Electrical Conductivity and Mechanical Properties

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Date Published: 5/19/2015 **Conference:** ICSR (Soldering and Reliability)

Abstract: In this talk, we will present the research progress on the use of graphene to reduce the amount of silver in electrically conductive adhesives. The graphene nanosheets were first modified using sodium dodecyl sulfate (SDS) and used as auxiliary fillers inside the conventional electrically conductive adhesive (ECA) composite. Using the SDS modification approach, we were able to facilitate the dispersion of graphene inside the composite, which resulted in a significant electrical conductivity improvement of ECAs at noticeably low filler content. Addition of 1.5 wt% SDS-modified graphene into the conventional ECA with 10 wt% silver flakes led to a relatively low electrical resistivity of 35 Ohms.cm, while at least 40 wt% of silver flakes was required for the conventional and the hybrid ECAs with non-modified graphene to be electrically conductive. A highly conductive ECA with very low bulk resistivity of 1.6×10^{-5} Ohms.cm was prepared by adding 1.5 wt% of SDSmodified graphene into the conventional ECA with 80 wt% silver flakes. The mechanical properties of the ECA were investigated using the Hertzian indentation method and found that SDS-stabilized graphene nanosheets increased the modulus of the nanocomposites at much lower weight percentages. However, once it passes a certain weight percent, the modulus begins to quickly decrease.

Key Words:

Electrically Conductive Adhesives, Graphene, Electronic packaging

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