

# **The Study of Electric Resistance and Thermal Resistance on Metal Interface in Electrically Conductive Adhesive**

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## **1. Introduction**

The purpose of this study is to clarify mechanism of the electric conduction and thermal conduction. This purpose leads to the development of high-performance conductive adhesive.

## **2. Results and Discussions**

Firstly, the electric and thermal percolation network in conductive adhesive is visualized. At first, the 3D metal-filler dispersion is grasped by FIB-SEM. FIB-SEM is the method to continuously observe at constant intervals. Furthermore, percolation network is visualized for the first time as conductive path by thinning process.

Secondly, the electric conduction is analyzed. The number of contact points between fillers are measured. And the contact resistance of contact point of the average is calculated. In addition, about the electrode interface which has high interface electric, contact resistance per area is calculated by electric conduction analysis of finite element method. Furthermore, the electric resistance of conductive adhesive material is predicted by the contact resistance. And it is inspected that this method is proper by the comparison between prediction and measurement.

Thirdly, the thermal conduction is analyzed. Two thermal conduction effects are considered; thermal conduction by the free electron and by the molecule phonon. And effect of the molecule phonon is shown to occupy most. Therefore, thermal conduction is analyzed by finite element method. This method can add the effect of the resin phonon. Particularly, the effect of the interface is considered by interface element. Interface thermal resistance between the fillers is calculated by the result. Furthermore, the thermal resistance of conductive adhesive material is predicted by this interface thermal resistance. And it is inspected that this method is proper by the comparison between prediction and measurement.

## **3. Conclusions**

Filler characteristic is connected definitely with electric resistance and thermal resistance by this study. This method of this study clarify the material effect factor for electric conduction and thermal conduction of polymer composite. As for this study, the application to construction material, magnetic material, and fiber reinforcement material is expected.