

MECHANISMS OF THE LOW CONTACT RESISTANCE PROPERTIES FOR Ag-Pd-Mg CONTACTS

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ABSTRACT

In order to improve the contact resistance properties of Ag(40wt%)-Pd(60wt%) alloy, the doping of Mg and Cr into the Ag-Pd alloy was carried out. As previously reported, the Ag-Pd alloy with the Mg doping agent indicated marked improvements of the contact resistance property. In the present study, the mechanism of the low level contact resistance of the Ag-Pd-Mg alloy was clarified. First, scanning tunneling microscopy (STM) images for the Ag-Pd-Mg, Ag-Pd-Cr, and Ag-Pd alloys were observed. From these images, a high conductivity was found throughout the entire surface of the Ag-Pd-Mg alloy. However, surfaces of the Ag-Pd-Cr and Ag-Pd alloys exhibited low conductivity. Furthermore, to determine the mechanism of the high conductivity of the surface of the Ag-Pd-Mg alloy, the depth profile of the element distribution was analyzed using X-ray photoelectron spectroscopy (XPS). The results revealed that Ag existed throughout the entire surface of the Ag-Pd-Mg alloy. On the other hand, for the Ag-Pd-Cr alloy, no Ag was found anywhere. It was concluded that in the case of the Ag-Pd-Mg alloy, even if the surface was covered with oxide films, Ag should diffuse from the substrate to the film layer and the existence of Ag in the layer causes high conductivity. Therefore, low contact resistance properties can be obtained.

Key words: contact resistance, Ag-Pd alloy, Ag-Pd-Mg alloy, microrelay