

RESISTANCE CHANGE AT COPPER CONTACTS WITH THIN AND THICK OXIDE FILMS UNDER A ZERO FORCE LIQUID GALLIUM PROBE

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ABSTRACT

Experiments were performed to investigate the contact resistance behavior and breakdown characteristics of the oxidized copper surface. In order to eliminate the influence of the mechanical pressure on the contact resistance, a gallium liquid metal drop was used as the probe. Current was varied from 0.1mA to 1A and then ramped back down to 0.1mA. The voltage across the contact between a gallium drop and the oxidized copper was recorded. The contact resistance was then computed and plotted against the voltage. It was discovered that the A-fritting voltage of the contact was about 2.0V when the film thickness was about 55nm, which was consistent with the results of Holm. It was also observed that the film could break down and then recover partially for several cycles before the film was finally broken down completely to settle at a lower voltage. When the film thickness was 8nm or less, the measured contact voltage at the fritting stage was always less than 0.4V. In such cases, it was unable to observe the typical 'avalanche' A-fritting (breakdown) even though the film had not been ruptured by mechanical load.