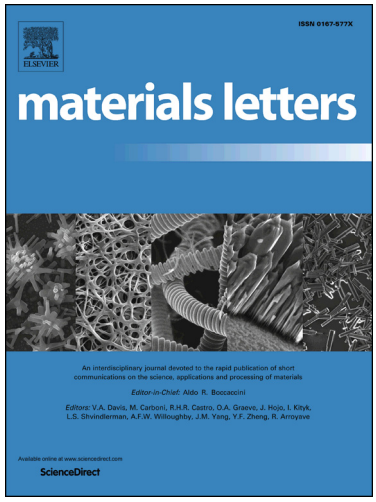

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Formation mechanism of a cathodic serrated interface and voids under high current density

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Abstract

In this paper, a Cu/$SnAg_{3.0}Cu_{0.5}$/Cu solder joint is current stressed under 6 A at 120 °C. After current stressing for 300 h, a serrated interface and voids are observed at the cathode. Current-crowding and thermal-crowding in solder grooves between adjacent Cu_6Sn_5 grains are found to be responsible for the back-diffusion of Sn and Cu atoms, eventually leading to the formation of a cathodic serrated interface and voids. In addition, the Sn orientation of the solder grooves may also play an important role in the robustness of the cathodic Cu_6Sn_5 grains and electrode. Our study may provide understanding of electromigration/thermomigration-induced evolution of the Cu/Sn interface under current stressing and provide visual data for interpreting early open-circuit failure of solder joints.

Keywords: Diffusion; Interfaces; Electromigration; Thermomigration; Solder; Intermetallic compound