An investigation of workability and flow instability of Sn-5Sb lead free solder alloy during hot deformation

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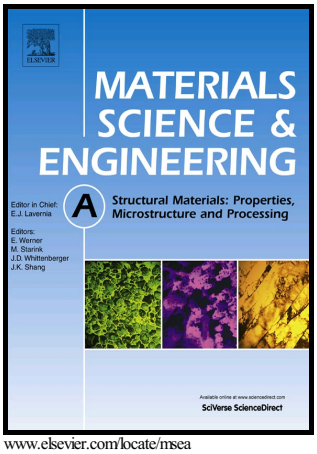

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An investigation of workability and flow instability of Sn-5Sb lead free solder alloy during hot deformation

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Abstract

Hot workability and flow instability of tin-based Sn-5Sb solder alloy has been investigated using hot compression tests at the temperature range of 300-400 K and strain rates between 0.0005 and 0.01 s^{-1}. The results indicate that the mechanism of softening involves both rehabilitative and damaging processes. Indeed, dynamic recovery and flow localization happened concurrently throughout the sample during hot deformation. Hot workability of this solder alloy has been evaluated by computing flow localization parameters and construction of workability maps regarding shear band formation. Moreover, based on dynamic material model concepts and dependency of flow stress on working temperature and strain rate, 3D processing maps for hot working of Sn-5Sb solder alloy was established.

Keywords

Sn-5Sb solder alloy; Hot deformation; Workability; Flow instability; Processing map.

1. Introduction

Lead containing solders such as lead-tin eutectics have been the common soldering materials for packing the conventional microelectronic assemblies. This is owing to their high temperature mechanical properties, excellent processing and cost effectively [1]. However, during recent years, concerns about the lead poisonousness together with international legislative pressures

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