Dislocations and Stress Corrosion Cracking in Ag_3Sn

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SUMMARY

Techniques have been developed that enable lattice defects to be observed in Ag_3Sn crystals using transmission electron microscopy. The presence of dislocations and other lattice defects within Ag_3Sn has been demonstrated and although complete analysis of micrographs was not undertaken, basic analysis has shown that the dislocations and other lattice defects run in $[\bar{1}10]$ $[1\bar{1}0]$ and $[\bar{1}\bar{1}0]$ directions. Although these directions do not belong to planes of a zone, there is agreement with previous authors who have observed twinning of Ag_3Sn during x-ray diffraction studies and found that the direction of shear was $[0\bar{1}\bar{1}]$ in the $(0\bar{1}0)$ plane.

It has been conclusively demonstrated, as a secondary aim of the project, that the intermetallic compound Ag_3Sn, in the presence of both mercury and tensile stress, is susceptible to stress corrosion cracking. It is this reaction which is probably the basis of the mechanism of the reaction between dental amalgam alloy and mercury.

Scanning electron microscope study of Ag_3Sn has confirmed the susceptibility of the alloy to stress corrosion cracking and has also shown that the alloy now appears to be heterogeneous and demonstrates the presence of grain boundary voids that explain difficulties experienced in preparation of transmission electron microscope specimens.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree of diploma in any University and, to the best of the author's knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text.

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