STEADY STATE CREEP DURING TRANSFORMATION IN SUPERPLASTIC Pb - Bi ALLOYS

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Pb-55.5 wt% Bi, and Pb-41.7 wt% Bi which are two superplastic alloys, have been investigated in tensile creep at different test temperatures between 313 and 343k, and constant stresses ranging from 6.36 MPa and up to 8.91 MPa for the first alloy (eutectic). The second alloy was studied under different applied stresses ranging from 6.77 MPa up to 9.85 MPa in the temperature range from 323 up to 383K. However, the results of both alloys showed a transition point at 328K for the first alloy and at 353K, for the second alloy, respectibely. The strain rate sensitivity parameter (m) for both alloys was fouund to change from 0.2 up to 0.9 in the temperature range from 308 up to 343K for the eutectic alloy (i.e Pb-55.5 wt %Bi). For the second alloy (m) changes from 0.5 up to 0.9 in the temperature range from 323 up to 383K, respectively. The activation energy of the steady state creep of the first (eutectic), and the second composition was found to be 29.4, 102 KJ/mole, and 49, 68.9 KJ/mole at the low, and high temperature regions, respectively. X-ray analysis and microscopic investigations of the test samples has been done to confirm the operating mechanism during steady state creep in these alloys.

Introduction

The basic phenomenon of supercondutivity [1] which involves extreme elongation in samples pulled in tension, has been shown by Backofen et al.[2] to be associated with the stabilizing effect of a high strain sensitivity of the flow stress [3,4]. Also, fine grain microstructures are formed in the eutectic alloys with duplex and multiphase structures. The alloys are significantly more superplastic. The type of phase or phases, their