

## Ag-Cu and Bi-Cd Eutectics Ribbons under Superplastic Tensile Test Regime

**Authors :** Edgar Ochoa, G. Torres-Villasenor

**Abstract :** Superplastic deformation is shown by materials with a fine grain size, usually less than 10  $\mu\text{m}$ , when they are deformed within the strain rate range  $10^{-5}$  to  $10^{-1} \text{ s}^{-1}$  at temperatures greater than  $0.5T_m$ , where  $T_m$  is the melting point in Kelvin. According to the constitutive equation for superplastic flow, refinement of the grain size would be expected to increase the optimum strain rate and decrease the temperature required for superplastic flow. Ribbons of eutectic Ag-Cu and Bi-Cd alloys were manufactured by using a single roller melt-spinning technique to obtain a fine grain structure for later test in superplastic regime. The eutectics ribbons were examined by scanning electron microscopy and X-Ray diffraction, and the grain size was determined using the image analysis software ImageJ. The average grain size was less than 1  $\mu\text{m}$ . Tensile tests were carried out from  $10^{-4}$  to  $10^{-1} \text{ s}^{-1}$ , at room temperature, to evaluate the superplastic behavior. The largest deformation was shown by the Bi-Cd eutectic ribbons,  $\epsilon=140\%$ , despite that these ribbons have a hexagonal unit cell. On the other hand, Ag-Cu eutectic ribbons have a minor grain size and cube unit cell, however they showed a lower deformation in tensile test under the same conditions than Bi-Cd ribbons. This is because the Ag-Cu grew in a strong cube-cube orientation relationship.

**Keywords :** eutectic ribbon, fine grain, superplastic deformation, cube-cube orientation

**Conference Title :** ICSMAA 2018 : International Conference on Superplastic Materials for Advanced Applications

**Conference Location :** Vancouver, Canada

**Conference Dates :** August 09-10, 2018