

The Strength and Ductility of L1₂ -Based Intermetallics

Final report

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For the first time a complete and systematic study has been made of the strength and ductility of the L1₂-based intermetallic compounds Ni₃X (X=Al,Ga,Ge,Ga), w/wo boron and w/wo notches. Variables included grain size, boron concentration, deviation from stoichiometry, temperature, strain rate, and notch geometry. Approaches included tensile, compression, hardness and Baughinger tests; optical microscopy; scanning, transmission and high-resolution scanning-transmission electron microscopy; and numerical modeling. The hypothesis tested was that the increase in ductility induced by boron is caused largely by an increase in the accommodation of slip at grain boundaries. The results and interpretations were published in 41 papers (refs. below). Every result obtained over the course of the study is consistent with this hypothesis. Indeed, every result obtained by other investigators on the same alloy systems is also consistent with the hypothesis. Thus, we conclude the study by saying that the grain boundary accommodation of slip is a major factor in accounting for the beneficial effect of boron on the strength and ductility of Ni₃X-based L1₂ intermetallics.

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