

CONSOLIDATION OF NANOSTRUCTURED Al-POWDER ALLOYS BY HOT EXTRUSION: GRAIN SIZE CONTROL AND MECHANICAL PROPERTIES

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Abstract

The effect of the extrusion temperature and ram speed during consolidation by hot extrusion of mechanical-alloyed Al-4.5%Cu alloy and Al6061 matrix reinforced with Si₃N₄ particle composite is discussed. Pre-existent precipitates in Al-Si₃N₄ alloy were very effective to control grain growth and to promote good mechanical properties on the consolidated alloys. Precipitation of Al₂Cu was observed when extruding the mechanical-alloyed Al-4.5%Cu alloy at 375°C and 400°C, but no precipitation was observed in the material extruded at 425°C. The mechanical properties of the consolidated alloys were found to be strongly dependent on the extrusion conditions and this behavior is discussed in association with the original and modified microstructures, which increased with decreasing temperature and increasing ram speed.

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