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Microstructure-dependent Mechanical Properties of Semi-solid Copper Alloys

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Abstract

Rotary swaging strain induced melt activation (RSSIMA) method is proposed to fabricate semi-solid copper alloys. The micro-grains size evolution of the globular particles during isothermal heat treatments is described by the Lifshize-Slorovitze-Wagner (LSW) equation and mechanical behaviors of semi-solid copper alloys and as-cast copper alloys are analyzed with the power-law Holloman work-hardening model. The effects of microstructure alteration on elasto-plastic properties of semi-solid tin copper alloys are reported. It has been discovered that the stiffness and strength of the alloy samples increase as micro-grain sizes decrease, whereas the alloys originated from various isothermal heat treatments. The strength of the semi-solid samples with globular micro-grains is also discovered to be higher than the strength of as-cast copper with dendrite micro-grains. These enhancements in mechanical properties can be understood by fine-grain mechanisms and precipitation

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