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超高强度Cu-5.2Ni-1.2Si合金的形变热处理

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摘要: 研究不同形变热处理条件下Cu-5.2Ni-1.2Si合金的性能与显微组织结构, 对合金的力学性能和电学性能进行测量, 并采用金相显微镜、透射电镜及电子衍射分析其显微组织。结果表明: 时效前的冷变形可以加速时效析出过程, 在时效初期尤为明显; 在450 °C时效时该合金的峰时效有3种强化机制: 调幅组织强化、析出的第二相粒子强化和有序强化; 析出的第二相粒子主要是Ni₂Si粒子; 采用铸锭—热轧—冷轧(变形量为60%)—时效工艺处理的合金可以得到硬度和导电率的最优组合。

关键词: Cu-5.2Ni-1.2Si合金; 形变热处理; 调幅分解; 有序化

Thermomechanical treatment of super high strength

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Abstract: The microstructures and properties of Cu-5.2Ni-1.2Si alloy under different heat treatment conditions were examined by mechanical and electrical properties measurement, optical microscopy, transmission electron microscopy. The results show that the cold deforming before aging may accelerated the process of ageing precipitation, especially in initial period of aging. The spinodal structure, ordering and the precipitation of phase Ni₂Si induce the main strengthening effects on the Cu-5.2Ni-1.2Si alloy saluted at 980 °C for 30 min then aged at 450 °C for 60 min. The optimal, synthetical properties of the Cu-5.2Ni-1.2Si alloy can be achieved by the treatment as follow: casting—hot rolling—cool rolling to 60%—aging.

Key words: Cu-5.2Ni-1.2Si alloy; thermomechanical treatment; spinodal decomposition; ordering

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