

Abstract

**INFLUENCE OF Ni AND Si ADDITIONS ON THE MICROSTRUCTURE,
MECHANICAL PROPERTIES AND CONDUCTIVITY OF CuZn30 ALLOY**

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Abstract

Growing demands for sustainable development and efficient material use encourage the design of copper alloys with longer service life and reduced environmental impact.

In this work, the CuZn30 alloy was modified with small additions of Ni (up to 3 mass%) and Si (up to 0.7 mass%) to investigate a simple approach to improving selected properties relevant to engineering applications. The concept is based on precipitation strengthening through the formation of the δ -Ni₂Si phase, which can enhance mechanical properties while moderately affecting electrical and thermal conductivity.

The experimental program included casting of selected alloy compositions, solution annealing at 900 °C for 2 h, water quenching, pressing, subsequent aging at 300 °C for 8 h, and characterization of electrical conductivity, microhardness, Leeb hardness, thermal conductivity, and microstructural analysis using SEM-EDS.

For the alloy containing 3 mass% Ni and 0.7 mass% Si, electrical conductivity decreased from 13.6 to 9.8 MS/m, while microhardness increased from 126.3 to 203.9 HV_{0.15}, and Leeb hardness increased from 350 to 556 HDL compared with the base CuZn30 alloy. Thermal conductivity at 25 °C decreased from 131.49 to 90.62 W/mK, and at 400 °C from 172.83 to 141.19 W/mK for the same alloy. Microstructural analysis confirmed that fine δ -Ni₂Si precipitates were formed during the annealing process.

The results indicate that Ni and Si additions, combined with a simple heat-treatment route, can be an effective strategy to improve the properties of CuZn30 for environmentally eco-friendly engineering applications.

Keywords: brass, CuZn30 alloy, precipitation, microstructure, microhardness, conductivity

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