

Effect of high content of nickel and silicon on the microstructure and properties of Cu-Ni-Si alloys

Ping Tao¹, Ling LU², Hui Xie¹, Long Zhang¹, and Xin Wei¹

¹Xi'an Aeronautical University

²Xi'an University of Technology

April 26, 2021

Abstract

Cu-Ni-Si alloys have been widely applied in electronic and electrical industries. The effect of precipitation on the microstructure and properties of the alloys are still not well understood. In this study, Cu-Ni-Si alloys were prepared by hot-pressed sintering and elemental copper powders, nickel powders and silicon powders as raw materials. The results show that, there were no Ni-Si intermetallic compounds except the δ -Ni₂Si phase in the microstructure by hot-pressed sintered preparation of Cu-Ni-Si alloys. And the distribution of the δ -Ni₂Si phase in the alloy was more uniform and smaller. After aging treatment, when the mass ratio of Ni and Si were 2:1 and 3:1, the precipitation of δ -Ni₂Si phase was significantly less, and when the mass ratio of Ni and Si were 4:1 and 5:1, the precipitation of δ -Ni₂Si phase particles increased significantly. The test results by electrical conductivity and vickers hardness show that after ageing treatment, both the electrical conductivity and vickers hardness of the alloys were greatly improved. When the electrical conductivity was 39.33%IACS, the vickers hardness was 230.95HV, and the Cu-Ni-Si alloy had the best comprehensive performance.

Hosted file

Manuscript.pdf available at <https://authorea.com/users/410137/articles/519614-effect-of-high-content-of-nickel-and-silicon-on-the-microstructure-and-properties-of-cu-ni-si-alloys>