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Investigation of Thermal and Mechanical Properties of Cu-Al alloys with silver addition prepared by Powder Metallurgy

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Abstract:

In this study, Cu-10wt.% Al-Xwt.% Ag alloys (X=0.0, 2.0, 2.5, 3.0, 4.0, 5.0, 5.5, 6.0) were synthesized through Powder Metallurgy. The effect of silver addition on microstructural, thermal and mechanical properties of the prepared alloys were investigated by using Scanning Electron Microscopy (SEM), Energy Dispersion Spectroscopy (EDS), X-rays Diffractometry (XRD), Transient Plane Source method (TPS), Rockwell hardness tester and Universal testing Machines. The XRD result of raw materials such as pure copper, pure aluminum, pure silver were qualified through JCPDS cards, and subsequently quantified. The microstructural analysis of all samples was carried out, with heating rate of 5°C/min and annealed at room temperature. The results indicated that presence of silver in Cu-Al alloy offered better hardness up-to 3%Ag and compression strength increases up to 2%Ag in Cu-10wt. %Al alloys which shows intermetallic structure in XRD analysis. Thermal conductivity and thermal diffusivity of the prepared alloys are investigated with help of TPS method in this work. It is observed that both thermal conductivity and thermal diffusivity increased with the increase of silver contents in the alloys owing to higher conductive behavior of silver.

Keywords: Powder metallurgy, Silver, Aluminum bronze, Thermal and Mechanical Properties.

1. Introduction

Copper alloys have numerous industrial solicitations due to their thermal, electrical and good mechanical features and characteristics. Connectors, heat exchanger, piping, radiator etc are synthesis by copper alloys. The elemental copper can be introduced with addition of different

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