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Ebrahimi, M., Attarilar, S., Shaeri, M.H., Gode, C., Armoon, H., Djavanroodi, F.

An investigation into the effect of alloying elements on corrosion behavior of severely deformed Cu-Sn alloys by equal channel angular pressing
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Abstract
To overcome some possible deficiencies of pure copper, dilute alloying and employment of equal channel angular pressing seem the cost-effective solutions. In this work, dilute copper alloys with the tin amount of 0.18, 0.3, and 0.5 wt.% were obtained with continuous casting and subsequently, they were subjected to ECAP process up to four passes. It was shown that integrated treatment by dilute alloying and ECAP lead to 182% improvement of the corrosion resistance as compared to the as-received condition due to the grain refinement. Meanwhile, the alloying impact on current density is decreased with the ECAP process which may result from the changes at the distribution of Sn atoms in Cu. The difference in measured corrosion current density of unprocessed and ECAPed samples for the alloys Cu-0.3%Sn and Cu-0.5%Sn are 15% and 2%, respectively. The corrosion improvement by means of current density reduction due to the alloying before the ECAP process is about 45% while this value after the ECAP diminishes to 35%. Microstructure analysis showed that four passes of ECAP process cause the average grain size of the pure copper to less than 700 nm and the Cu-0.5%Sn to about 550 nm. Also, the HAGBs fraction of the ECAPed pure Cu is 74%, while the corresponding magnitude for the Cu-0.5%Sn is 78%. © 2019 Politechnika Wrocławska

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