Influence of microstructure on the hardness and electrical conductivity of CuCrZr alloy submitted to ECAP followed by aging and swaging

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Grain boundaries are fundamental in the mechanical behavior of ultrafine grains materials, especially coincidence site lattice grain boundaries (CSL-GB). This research aims to identify the influence of CSL-GB on the hardness and electrical conductivity of a CuCrZr alloy subjected to rotary swaging after having undergone severe plastic deformation via equal channel angular pressing and aging. Vickers hardness was evaluated and electrical conductivity was measured using the 4-point technique. The average grain size and CSL-GB distribution were identified using backscattered electron diffraction. Dislocation density was disclosed via X-ray diffraction. It was observed at the end of swaging processing of CuCrZr alloy with preexistent ultrafine grains, that the dislocation density ceases to be the major influencer parameter on the modification of properties and the grain boundaries passes to be more impacting. The reduction of CSL-GB and the concomitant increase in high angle grain boundaries can lead to decrease of hardness and electrical conductivity.

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