
The effect of deformation texture and grain boundary character distribution on the low rate deformation in binary zinc alloys

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Abstract

Zinc alloys are currently intensively researched as a group of materials with perspective application in bioresorbable temporary implants for bone fracture treatment or cardiovascular stents. While having optimal bio-corrosion properties, the zinc based alloys have to be engineered to overcome the intrinsically low mechanical performance of pure zinc. Solid solution strengthening combined with secondary phase and grain refinement are typically employed to significantly improve the yield strength, while maintaining plasticity required for cardiovascular stent applications. However, the desirable yield strength increase is usually accompanied with deteriorated creep resistance, due to strong strain rate sensitivity and exaggerated grain boundary sliding in grain refined zinc alloys(1,2).

In this work the effect of the deformation texture and grain boundary character distribution on the strain rate sensitivity in low alloyed binary zinc alloys was investigated. The Equal Channel Angular Pressing combined with low temperature rolling and heat treatment was employed to modify the texture and microstructure of alloys. Nanoindentation with strain rate jump tests and SEM in-situ tensile tests combined with EBSD mapping were used to measure strain rate sensitivity exponent and evaluate grain boundary sliding in areas of defined texture and microstructure.

The results of mechanical testing will be correlated with the texture and the relative deformation mechanisms activity will be estimated in alloys with modified microstructure.

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