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MICROALLOYED MAGNESIUM WITH EXCEPTIONAL MECHANICAL PERFORMANCE FOR DEGRADABLE IMPLANT APPLICATIONS

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Abstract

New Mg–Zn alloys have been developed according to a microalloying concept and in consideration of grain growth restriction during alloy casting and forming. After extrusion they reveal very fine grains, high ductility at considerable strength and homogeneous distribution of intermetallic particles, which suppress grain growth even at comparably high temperatures. The new alloys exhibit also a very low tension-compression asymmetry (Rp,ten / Rp,com ˜ 1). This phenomenon is not only ascribed to the weak as-extruded texture but also to the fine-grained structure, which suppresses twinning activity and enables activation of complementary deformation modes (non-basal slip) at RT. Indeed, plastic deformation simulations indicate low tensile twinning activity and promoted non-basal slip. The overall performance including slow and homogeneous in vitro and in vivo degradation behavior and the choice of only biocompatible alloying elements make the new alloys promising for temporary implant applications.

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