Quantitative understanding of microstructure evolution in Mg alloys during shear assisted processing and extrusion with different extrusion rates.

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Abstract

The process of extruding metal is being revolutionized by Shear Assisted Processing and Extrusion (ShAPE), which mixes and deforms solid feedstock in a novel way without the need for external heat treatment or melting. The revolving extrusion die is forced up against solid billet, flake, powder, or scrap metal material. Friction and distortion at the interface between the die and feedstock produce heat, softening the material just enough to allow it to extrude through the revolving die. Extreme deformation is produced by the combination of rotating, mixing and linear pressing, opening up new material chemistries and structural options not achievable with traditional extrusion. Studies indicate that the second phase dispersion, hardness, texture, and size during extrusion are expected to be influenced by the axial feed rate, the ram rotations per minute, and the scroll profile design. This study investigates the mechanical properties and microstructure and texture evolution of magnesium alloys treated with ShAPE technique at different extrusion rates.

Keywords: ShAPE, extrusion rate, microstructural evolution, Mg alloys, severe metal deformation

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