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Influence of microalloying on microstructure and mechanical properties of rapidly solidified ribbon-consolidated Mg-based alloys

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Rapid solidification is a processing technology that enables the refinement and homogenization of the grains and intermetallic particles, and supports the formation of non-equilibrium phases. In the case of dilute Mg-Y-Zn alloys (up to 1-2 at.% of Zn and Y), the consolidation of the rapidly solidified (RS) ribbons via extrusion results in microstructure containing dynamically recrystallized (DRX) and non-recrystallized (non-DRX) grains with dispersed solute-segregated stacking faults (SFs). These alloys exhibit high tensile strength, moderate ductility, and enhanced corrosion resistance comparing to extruded alloys of the same composition. Therefore, such materials are considered as promising materials for biomedical application. Considering further improvement of properties of RS ribbon-consolidated Mg-based alloys, the effect of microalloying (up to 0.4at.%) of biocompatible Ca, Mn, Nd elements in $Mg_{97.44}Y_{1.5}Zn_{0.56}$ on the microstructure and mechanical properties is revealed in scope of present research. Investigated alloys are characterized by rather inhomogeneous microstructure, containing small DRX and elongated along extrusion direction (ED) non-DRX grains. Detailed analysis of orientation maps indicated that most of the elongated grains have a preferential orientation with the 10-10 axis oriented along ED. It results in slightly higher texture intensity at the 10-10 pole. Besides, DRX grains are characterized by random orientation. The average grain size of the DRX grains is about 540-860 nm. The presence of solute-segregated SFs enriched with the Zn and Y in α-Mg phase has been revealed in all studied alloys. In order to reveal the effect of microalloying on the mechanical properties, samples were subjected to tensile loading along ED at room temperature.