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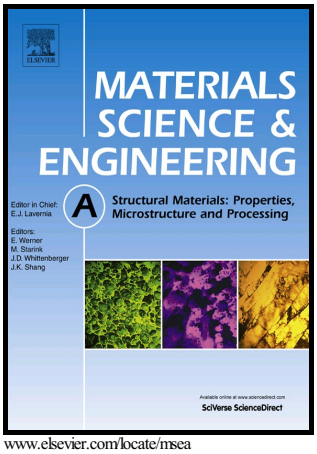

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Effects of Sn and Y on the microstructure, texture, and mechanical properties of as-extruded Mg-5Li-3Al-2Zn alloy

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Abstract: The effects of combined addition of Sn and Y on the microstructure, texture, and mechanical properties of as-extruded Mg-5Li-3Al-2Zn alloy were investigated. The results show that the microstructure of as-extruded Mg-5Li-3Al-2Zn alloy mainly consists of α-Mg and AlLi phases. With the addition of Sn and Y, Mg_2Sn and Al_2Y compounds form, while AlLi phase gradually disappears with increasing Y content. These second phases are crushed into smaller particles during hot extrusion process, and Al_2Zn particles are found in Mg_2Sn-rich regions and distribute along the grain boundaries. Meanwhile, the microstructure is significantly refined, and the combined addition of 0.8 wt.% Sn and 1.2 wt.% Y produces the smallest grain size of 4.78 μm and the uniform microstructure is entirely composed of equiaxed grains. Additionally, the addition of Sn and Y weakens the basal texture of as-extruded alloy and introduces recrystallization texture due to solute drag effect and dynamic recrystallization. As-extruded Mg-5Li-3Al-2Zn-0.8Sn-1.2Y alloy exhibits a superior combination of tensile properties with ultimate tensile strength and elongation of 328.0 MPa and 25.1%, which are increased by approximately 32.2% and 41.0% compared with those of as-extruded Mg-5Li-3Al-2Zn alloy (248.2 MPa and 17.8%), respectively. The improvement of mechanical properties is mainly attributed to solution, dispersion, and grain