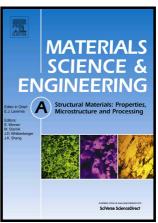
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Influence of Al and Si additions on the microstructure and mechanical properties of Mg-4Li alloys

Zilong Zhao^a, Ziwei Sun^a, Wei Liang^{a, b*} Yide Wang^{a, b}, Liping Bian^{a, b}

^aCollege of Materials Science and Engineering, Taiyuan University of Technology, Taiyuan 030024, China

^bShanxi key laboratory of advanced magnesium-based materials, Taiyuan 030024, China

Abstract

The microstructure and mechanical properties of four hot-rolled alloys, Mg-4Li, Mg-4Li-3Al, Mg-4Li-3Al-0.38Si and Mg-4Li-6Al-0.76Si, (weight percent) were investigated. The results showed that the addition of Al and Al-Si eutectic results in the precipitation of Al $_3$ Li(Mg) within the hot-rolled alloys. The Al $_3$ Li(Mg) is present as a solid solution of Mg in Al $_3$ Li with an Ll $_2$ superlattice structure, which precipitates as small spherical particles. Another minor constituent present as a precipitate in the Si-containing alloys, Mg-4Li-3(Al-Si) and Mg-4Li-6(Al-Si), is a Mg $_2$ Si phase which is broken into polygonal particles in the hot-rolled alloys. Ultimate tensile strength (UTS) up to 295 MPa was measured for the Mg-4Li-6(Al-Si) alloy, compared with 143 MPa for the Mg-4Li alloy. This improvement is attributed to precipitation strengthening imparted by the Al $_3$ Li(Mg) and Mg $_2$ Si phases, as well as solid-solution strengthening due to Al atoms dissolved in the α -Mg matrix of the alloys.

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