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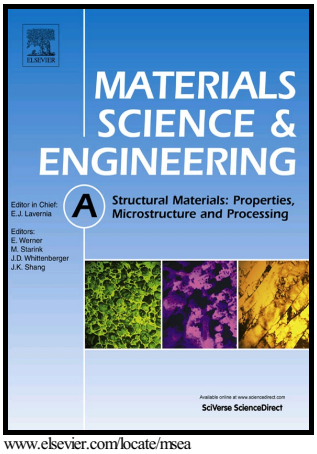

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PII: S0921-5093(17)30846-8
DOI: http://dx.doi.org/10.1016/j.msea.2017.06.077
Reference: MSA35215

To appear in: *Materials Science & Engineering A*

Received date: 25 November 2016
Revised date: 15 June 2017
Accepted date: 19 June 2017

Cite this article as: Zilong Zhao, Ziwei Sun, Wei Liang, Yide Wang and Liping Bian, Influence of Al and Si additions on the microstructure and mechanical properties of Mg-4Li alloys, *Materials Science & Engineering A* http://dx.doi.org/10.1016/j.msea.2017.06.077

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

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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_3Li(Mg) within the hot-rolled alloys. The Al_3Li(Mg) is present as a solid solution of Mg in Al_3Li with an $L1_2$ 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_2Si 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_3Li(Mg) and Mg_2Si phases, as well as solid-solution strengthening due to Al atoms dissolved in the α-Mg matrix of the alloys.