Tensile flow and strain-hardening behaviors of dual-phase Mg-Li-Zn alloy thin sheets

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Abstract

The tensile flow behavior and associated microstructure changes of the cold-rolled MgLiZn alloys with a thickness of 0.6 mm containing approximately 6 wt% and 9 wt% of Li were examined under tension. Tensile tests were carried out on specimens in the directions of 0, 45 and 90° to the rolling direction using an initial strain rate of 1.6710－3 s－1 at room temperature. Kocks－Mecking type plots were constructed to illustrate different stages of strain-hardening. The results showed that tensile properties could be related to the deformed microstructures. Analysis of the flow behavior and the deformed microstructures indicated that the mechanical properties were related to the deformation of BCC β-phase in the cold-rolled Mg6Li1Zn (designated as LZ61) alloy sheet. The β-phase did not show significant deformation in the 90º specimens, leading to a higher strength and a higher stage II strain-hardening rate in this direction in the LZ61 alloy sheet. The activity of non-basal slips resulted in the considerable deformation of the α-phase in all test directions in the cold-rolled Mg9Li1Zn (designated as LZ91) alloy sheet.

Keyword：magnesium-lithium alloy; tensile flow behavior; strain-hardening; strain-hardening rate.