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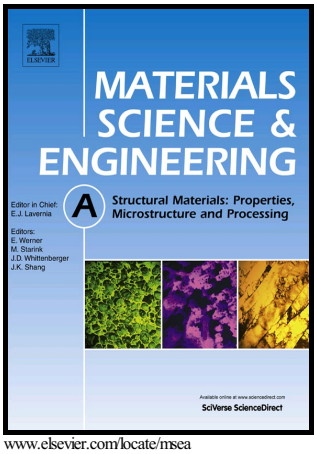

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Effect of alloying elements on room temperature stretch formability in Mg alloys

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Abstract

The effect of alloying elements on room temperature stretch formability and its deformation mechanism was investigated using pure magnesium and its binary alloys containing an element of Ag, Al, Ca, Li, Mn, Pb, Sn, Y and Zn, respectively. All of the alloys as well as pure magnesium were produced by extrusion and had a similar average grain size. The alloying elements clearly affected stretch formability as measured by Erichsen testing. The addition of manganese and yttrium elements played a role in improving formability; on the other hand, most of the alloying elements did not improve formability, as exhibited by their limited dome height values, which were similar to or lower than that of pure magnesium. This resulted from their differences in deformation mode. An intragranular misorientation axis analysis using electron back-scatter diffraction results revealed that the Mg-Y alloy had a high fraction of grains amenable to non-basal dislocation slips, which is a helpful deformation mode for improving formability. In contrast, pure magnesium and the Mg-Mn alloy, which had a high limited dome height, did not have a high fraction of such grains. Grain boundary sliding compensated for the lack of <***c***>-component, such as activating non-basal dislocation slips.

Keywords: Magnesium, Solute atom, Stretch formability, Erichsen test, Limited dome height, Electron back scatter diffraction method