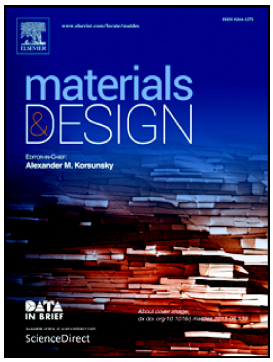

Investigation of the hydrogen states in magnesium alloys and their effects on mechanical properties

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Investigation of the hydrogen states in magnesium alloys and their effects on mechanical properties.

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Abstracts

This work investigates the hydrogen states and their corresponding effects on the mechanical properties of several kinds of magnesium alloys. Magnesium alloys can have tens to near hundreds μg/g of hydrogen, depending on the alloying element species and additions. Pure Mg has a hydrogen content of 12.7 μg/g. Al and Zn have a limited influence on hydrogen content, and the addition of rare earth elements Y, Gd and Nd significantly increases the hydrogen content to as high as 95 μg/g. Excess hydrogen causes highly alloyed magnesium alloys to suffer from gas porosity problems and deterioration of mechanical properties. The mechanical properties of as-cast AZ91-0.4Ca alloy can be promoted after the removal of hydrogen. The ultimate strength can be improved from 95 MPa to 150 MPa. The rare earth containing magnesium alloys are less likely to suffer gas porosity because excess hydrogen is incorporated into the cuboid-shaped rare earth hydrides. Additional hydride particles can form around the grain boundaries of the Mg-RE alloys during the homogenization. The formed hydrides should be mainly due to the strong hydrogen bonding by the rare earth atoms.

Keywords: Magnesium alloys; Hydrogen; Hydrides; Mechanical properties.

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