INTERMETALLIC PHASES IN THE AS-CAST MICROSTRUCTURE OF Al4Mg0.7Mn TYPE ALLOY WITH ZINC ADDITION[1]

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Abstract

Aluminium alloys with magnesium as the major alloying element constitute a group of non-heat treatable alloys with medium strength, high ductility, excellent corrosion resistance and weldability. Al—Mg alloys are used as structural materials in marine, automotive, aircraft and cryogenic applications.

The chemical composition of tested alloy is. 3.98%Mg, 0.08 %Si, 0.27 %Fe, 0.27 %Cu, 0.7 %Mn, 0.07 %Cr, 1.59 %Zn, 0.017 %Ti and 0.18 %Zr. The structure of Al-Mg-Mn alloy with Zn addition consists of grains of a - solid solution of aluminum with a dendritic-cell substructure, and a variety of intermetallic phases. The distribution of the various alloying elements on the microstructural scale is very inhomogeneous in the alloy. Enrichment of Mg and Zn, depletion of Mn and precipitates of different intermetallic compounds have been observed at the interdendritic regions of this alloy.

The dominant intermetallic phases formed during solidification of tested alloy have been identified to be Al-Fe-Mn, Al-Zn-Mg and Al-Zn-Mg-Cu. SEM/EDS analysis revealed that the MgtSi and Ę phases do not form during nonequilibrium solidification in this alloy.

The zinc addition in tested Al-Mg-Mn alloy precludes the formation of Ę-phase precipitates, resulting instead in the formation of a chemically and structurally distinct Al-Mg-Zn phase at grain boundaries and interdendritic regions.

While the I -phase has been reported in 7000 series alloys containing high levels of Zn, this study indicates that the T -phase can also form extensively in Al-Mg-Mn alloy with Zn addition.

Keywords: Al4Mg0.7Mn type alloy, zinc addition, T phase

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