Effects of Ag addition on the Precipitation Hardening Behaviours and Corrosion properties of Al-Mg-Si Alloy

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doi: 10.20964/2019.01.30

Received: 1 September 2018 / *Accepted:* 15 October 2018 / *Published:* 30 November 2018

The effects of Ag on the microstructure, dynamic precipitation and corrosion properties of Ag-Mg-Si alloys were investigated, by using scanning electron microscopy (SEM), transmission electron microscopy (TEM), potentiodynamic polarization measurements and differential scanning calorimetry (DSC). The results show that with the increase in Ag content, the alloys peak hardness, the aging hardening speed and the electrical conductivity increase, but the softening speed decreases. The addition of Ag significantly accelerates the kinetic process of aging precipitation of Ag-Mg-Si alloy, improves the density and the thermodynamic stability of β'' phase (Mg_5Si_6) and reduces the precipitation activation energy of the β'' and β' phase. The alloy without Ag exhibits severe local corrosion and intergranular corrosion; the alloy with 0.3 wt.% Ag exists fewer grain boundary precipitates and exhibits a slight intergranular corrosion (IGC). The addition of excess Ag leads to the increase in the corrosion sensitivity.

Keywords: Ag-Mg-Si alloy; Ag content; thermodynamic; corrosion property; hardening behavior

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