Effects of Ag on Age-hardening behavior of Al-Mg-Si alloys

Abstract of this project 2003

Al-Mg-Si alloys (6xxx) own medium-strength structures with good weldability, corrosion resistance and high damping capacity. The main aging precipitates are β' or β phase in Al-Mg-Si base alloy or Al-Mg-Excess-Si alloy, which have been studied by many researchers [2-6]. In order to improve their properties, other elements have been also added in Al-Mg-Si alloys. About these metal elements, there are many reports about the addition of copper (Cu) into Al-Mg-Si alloys to enhance their mechanical properties, especially their ductility. There is a few report of the effect of silver (Ag) on the age-hardening of this alloy, and it provides the improvement of mechanical property. However the mechanism of its being improved keeps being a secret and we don’t know whether it is same with the effect of Cu on precipitation of Al-Mg-Si alloy. In an Al-1.9Cu-0.3Mg-0.2Ag (at.%) alloy, L. Reich et al. have reported that co-clusters of Ag and Mg atoms were presented at the early stage of aging. It is possible that Ag addition can affect the formation of clusters in Al-Mg-Si alloy that forms a lot of Mg-Si cluster (GP zone) at the early stage of aging. It will influence the formation and growth of precipitates if both Mg-Si cluster and Mg-Ag cluster are formed. In the present study, I have investigated the hardening response in Al-1%Mg2Si-0.60%Si -0.5%Ag alloy during artificial aging at 443K, and tried to understand the effects of Ag addition on aging behaviour by the way of HRTEM and EDS. As a comparison, the Ag-Free Al-1%Mg2Si-0.60%Si alloy is also studied under the same heat-treatment condition.

Keywords: Al-Mg-Si alloy, precipitate, Ag-bearing, high resolution transmission electron microscopy