

Precipitation and Age Hardening in Al-Mg-Si-(Cu) Alloys for Automotive Body Sheet

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Abstract : This present work is focused on the hardening precipitation in two AlMgSi(Cu) automotive body sheets. The effect of pre-aging, aging treatment and 0.10 wt % copper addition on the hardening response was investigated using scanning calorimetry (DSC), transmission electron microscopy (TEM), and Vickers microhardness measurements (Hv). The results reveal the apparition of α -AlFeSi, α -AlFe(Mn)Si type precipitates frequently present and witch remain stable at high temperature in Al-Mg-Si alloys. Indeed, the hardening response in both sheets is certainly due to the predominance of very fine typical phases β' and β'' as rods and needles developed during aging with and without pre-aging. The effect of pre ageing just after homogenization and quenching is to correct the undesirable effect of aging at ambient temperature by making faster alloy hardening during artificial aging. The addition of 0.10 wt % copper has allowed to refine and to enhance the precipitation hardening after quenching.

Keywords : AlMgSi alloys, precipitation, hardening, activation energy

Conference Title : ICMMSSE 2023 : International Conference on Metallurgy, Materials Science and Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : October 16-17, 2023