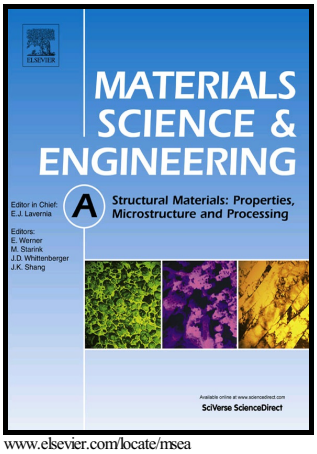
On the role of precipitates in controlling microstructure and mechanical properties of Ag and Sn added 7075 alloys during artificial ageing

Abhishek Ghosh, Manojit Ghosh, Gyan Shankar



www.elsevier.com/locate/msea

PII: S0921-5093(18)31317-0
DOI: https://doi.org/10.1016/j.msea.2018.09.109
Reference: MSA36990

To appear in: *Materials Science & Engineering A*

Received date: 27 July 2018
Revised date: 16 September 2018
Accepted date: 28 September 2018

Cite this article as: Abhishek Ghosh, Manojit Ghosh and Gyan Shankar, On the role of precipitates in controlling microstructure and mechanical properties of Ag and Sn added 7075 alloys during artificial ageing, *Materials Science & Engineering A,* https://doi.org/10.1016/j.msea.2018.09.109

On the role of precipitates in controlling microstructure and mechanical properties of Ag and Sn added 7075 alloys during artificial ageing

Abhishek Ghosh[a,*], Manojit Ghosh[a], Gyan Shankar[b]

[a]Department of Metallurgy and Materials Engineering, Indian Institutes of Engineering Science and Technology, Howrah -711103, India

[b]Department of Materials Engineering, Indian Institute of Science, Bangalore 560012, India

abhishek.me.08@gmail.com

manojit_ghosh1@rediffmail.com

[*]Corresponding author.

Abstract:

Tailoring size, density and nature of precipitates by ageing and alloy additions and subsequent correlation with microstructure and mechanical properties for 7075 alloys was investigated in current research. The effect of the minor addition of Ag and Sn in 7075 base alloy has been revealed using optical microscopy (OM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and differential scanning calorimetry (DSC). The hardness and tensile testing were carried out as a part of mechanical properties evaluation. Under peak age condition (T6), even a minor addition of Ag and Sn was found to decrease the average grain size and impart uniformity in the pattern of the dispersed intermetallic phases in the matrix compared to base 7075 alloy. The enhancement of precipitation kinetics owing to the addition of Ag and Sn in AA 7075 has been confirmed by the results obtained from DSC. Johnson-Mehl-Avramani (JMA) equation was used to calculate the amount of precipitates, its kinetics of formation and activation energies of each phase at different temperatures. It demonstrated that activation energies of phases (GP zone dissolution and η') for Ag bearing alloy were decreased which suggested that Ag possessed a positive effect on the early decomposition of GP zone and η' precipitates. In the effort to explain the higher strength and ductility with Ag and Sn added alloys, the microstructural attributes in the form of generation of more heterogeneous nucleation sites coupled with a high density of fine η' precipitation throughout in the matrix, observed through TEM