

Precipitation strengthening in extruded AZ61 magnesium alloys during heat treatment process

ABSTRACT

Magnesium alloys, in particular the commercial wrought alloy, AZ61 has been increasingly considered as an attractive material in the transportation industry. The objective of this paper is to determine the microstructure change and Mg₁₇Al₁₂ precipitation in the alloy and to evaluate its mechanical properties. After primary microstructure characterization and mechanical testing in the as-extruded condition the specimens are subjected to heat treatment to the temperature 400°C for one hour followed by quenching in the water. Specimens treated were found to have a coarse grain, homogeneous structure with a substantial increase in grain size. Optical observations also reveal Mg₁₇Al₁₂ precipitations grow in the form of needle shape within the grain after two hour aging. The mechanical properties and the Hardness Vickers (HV) of the AZ61 magnesium alloy are also found to increase owing to secondary hardening by precipitation strengthening. Therefore, the deformation mechanism improved the materials properties ex-specially in automotive industry. Future work should focus on the improvement of different mechanical properties such as fracture toughness and creep resistance by using precipitation strengthening.

Keyword: AZ61 magnesium alloy; Heat treatment; Mg₁₇Al₁₂ precipitation; Aging