Abstract

Specimens of Al7075 – T6 were heated for one hour at retrogression temperatures 100, 120, 140, 160, 180, 200, 220, 240, 260, 280 and 300 °C to study the effect of retrogression temperature on the strength parameters (yield stress, ultimate tensile stress and fracture stress) and stress relaxation response over the entire stress – strain curve at room temperature. The heat-treatment of the specimens for one hour in the temperature range 100 – 200 °C has no significant effect on the yield stress, ultimate tensile stress, and fracture stress. This is attributed to the fact size of fine semi-coherent $\acute{\eta}$ precipitates ($MgZn_2$) responsible for hardening of the alloy specimens, is not changed on heating in this temperature range. The yield stress, ultimate tensile stress, and fracture stress of the specimens decrease rapidly with the increase in heat-treatment temperature from 200 °C to 300 °C. This is attributed to the progressive coarsening of semi-coherent $MgZn_2$ hardening precipitates with the increase in temperature in this range. The stress relaxation rate s increases linearly with the strain ε_o at which stress σ_o is allowed to relax in Al7075 – T6 alloy specimens.The stress relaxation parameter ($ds/d\varepsilon_o$) of the alloy specimens varies with retrogression temperature in a manner similar to that of the strength parameters (YS, UTS, and FS). The stress relaxation response ($ds/d\varepsilon_o$) is therefore also dictated by the nature (size and distribution) of fine semi-coherent $\acute{\eta}$ precipitates ($MgZn_2$) responsible for hardening of the alloy specimens. Stress relaxation rate s increases with initial stress level σ_o rather slowly in low strain region and rapidly in high strain region. The values of intrinsic height U_o of the energy barrier controlling the movement of relaxing dislocations are on the average 1.71 eV and 0.82 eV in low and high strain regions, respectively, and are of the order of recovery processes, e.g. vacancy formation by non-conservative motion of jogged dislocation, cross slip, mutual destruction of edge dislocations by forced climb in dipole configuration, etc.