Changes in Microstructure and Mechanical Properties by Deformation-Restricted Forging Followed by Extrusion of AZ80Mg Alloy Rod

Hiromi Miura*[1], Yojiro Oba[1], Masakazu Kobayashi[1], and Chihiro Watanabe[2]

[1]Toyohashi University of Technology – Japan
[2]Kanazawa University – Japan

Abstract

A process for strengthening of Mg alloy rods by controlling texture is newly proposed. At first, AZ80Mg rods are forged along longitudinal direction (LD) at extremely high pressures beyond the fracture stress under a condition in which plastic deformation is eliminated in a die, i.e., deformation restricted forging (DRFing). And next, they are cold extruded (Figure 1). Even while the hardness was gradually raised with DRFing stress, the yield strength along LD was drastically lowered. The former was due to the combined effects of strain hardening by plastic deformation and grain refinement by mechanical twinning. On the other hand, the latter was derived by a sharp (0001) basal texture evolution on the forging plane. Extrusion after DRFing drastically changed the (0001) // LD texture to (0001) LD one, which induced drastic increace in yield strength. Hence, after the combined processes of DRFing and extrusion, the yield strength was noticably raised from 254 MPa of the initial hot extruded rod up to 482 MPa. The above results indicated the important role of texture strengthening as well as strain hardening and grain refinement.

Keywords: Mg alloy rod, DRF, Microstructure, Mechanical twin, Basal texture, Mechanical properties

*Speaker