Direct Observations of the Interaction between Dislocations and Precipitates in an Aluminium-Silicon Alloy

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Abstract

A transmission electron microscopic investigation has been carried out on the interaction between dislocations and precipitates in thin foils of an aged aluminium alloy containing 1.36 at% silicon. From the measurement of the radius of curvatures of moving dislocations expanded between precipitates, the stress acting on the dislocations has been determined for several stages of ageing. The result shows that the dislocations cut through the small pecipitates at an early stage of ageing. In the over-aged state, however, the by-pass process, formation of dislocation half-loops around the precipitates lying near the surface and loops surrounding several precipitates, prismatic dislocation loops due to double cross slip and tangling of dislocation around large precipitates have been directly observed. Comparison with the observations on the thin foils which were prepared from stretched bulk materials shows that these phenomenon might also occur in the bulk materials.

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