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Effect of equal channel angular pressing on fracture toughness of Al-7075
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Abstract
In this paper, influence of equal channel angular pressing (ECAP) on the fracture behavior of Al-7075 alloy is experimentally investigated. The specimens are successfully processed by ECAP methodology up to four passes using different routes. Transmission electron microscope (TEM) images showed that after four passes of ECAP, the average grain size is refined from 40 μm to less than about 500 nm. The percentage increase in yield strength, ultimate strength and microhardness of the specimens after four ECAP passes was 230, 90 and 110 respectively. Standard tests on the disk-shaped compact DC(T) specimens showed that fracture toughness is decreased up to 8% at the first ECAP pass while after four passes, this parameter roused to 17% higher than that of annealed condition. Furthermore, scanning electron microscope (SEM) micrographs demonstrated that ductile fracture mechanism with large dimples occurred in the annealed samples, changed to limited ductile fracture with fine dimples after ECAP process. This research provides new insights into the effect of ECAP and grain refinement on the fracture behavior of materials. © 2016 Elsevier Inc.

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