Reinforcement and hot workability of aluminium alloy 7075 particulate composites: a review

ABSTRACT

A proper selection of matrix and reinforcement result in the best combinations of physical and mechanical properties in the resulting a metal matrix composite (MMC). Al 7075 and Silicon Carbide (SiC) are commonly used as matrix and reinforcement, respectively, in the aviation and space ventures, which is mostly attributed to its low weight-to-strength ratio, high wear, and excellent creep resistance. This work reviews the properties of aluminium matrix composites that are reinforced with different particles. The first objective is to analyse the influence of volume fraction (or wet fraction) and grain size induced by different reinforcement particles on the mechanical properties of Al 7075 composites, while the second objective is to study the hot workability of Al 7075/SiCp composites in the context of its forming temperature, strain rate, volume fraction, and grain size. It has been found that the presence of hard and brittle ceramic reinforcement in aluminum matrix composites (AMCs) lead to reduce the elongation and fracture toughness of the resulting composite. Moreover, large grain size and high volume fractions (42 εm, 21%, and 32%, respectively) of reinforced particles result in the loss of ductility in the majority of MMCs. On the other hand, with a high percentage of reinforcements, metal matrix composites experiences poor hot working. In addition, the maximum deformation efficiency that can be obtained by Al 7075 reinforced with silicon carbide particles is 44%, at a volume fraction of 15%, grain size of 20 εm, temperature of 400°C, and a strain rate of 0.1 s-1.

Keyword: Aluminum particulate metal matrix composite; Al 7075 composites; Hot working; Mechanical properties