

Abstract

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Effect of Holding Time before Solidification on Double-Oxide Film Defects and Mechanical Properties of Aluminium Alloys

Double oxide films (bifilms) have been held responsible for the variability in mechanical properties of aluminium castings. It has been suggested that the air entrapped inside a bifilm can react with the surrounding melt leading to its consumption, which might improve the mechanical properties of the castings. In this work, the effect of the holding time of the melt before solidification on the distribution of mechanical properties, and by implication, on entrained double oxide films, was investigated for different aluminium alloys. The Weibull moduli of the plate castings were determined under tensile conditions, and their fracture surfaces examined for evidence of oxide films. The results suggested the occurrence of two competing mechanisms during the holding treatment. The consumption of air inside the bifilms due to reaction with the surrounding molten metal may lead to improvements in mechanical properties, but this may be accompanied by hydrogen passing into the bifilms, which has a deleterious effect on properties.