Deformation Characteristics of AZ31B-O Mg Alloy Sheet during Rapid Gas Blow Forming

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Abstract

A series of experiments was performed using tensile tests and stepwise pressurization profiles for gas blow forming to explore the deformation behavior of fine-grained Mg alloy AZ31B thin sheet. Decreasing the forming time in gas blow forming using fine-grained Mg alloy AZ31B thin sheet with a thickness of 0.6 mm has been studied in this work. During gas blow forming, thin alloy sheets were successfully deformed into hemispherical domes using two proposed stepwise pressurization profiles. As a result, significant reduction in forming time was achieved. Maximum effective deformation rates of 1.02 102 and 1.98 102 s1 were obtained at temperatures of 300 and 370C, respectively, when the thin alloy sheets were subjected to deformation. It was feasible to form a hemispherical dome with a height of 20 mm in less than 80 s at 370C. The results confirmed that the thickness distribution along the centerline of the formed dome was sensitive to the pressurization profiles. A higher thinning effect was observed at 370C due to the higher deformation rate imposed during forming. Grain growth was not a serious problem for forming even at a temperature of 370C, and static grain growth should be the major factor resulting in grain growth during forming.

Keyword：AZ31B Mg alloy, strain-rate sensitivity, gas blow forming, pressurization profile