Effect of Lubrication on Deformation Characteristics of A Superplastic 5083 Al Alloy during Bi-axial Deformation

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Abstract

Effect of lubrication on deformation behavior of a superplastic material has relatively been less examined, though it is important for industrial application. In this paper, a superplastic 5083 Al alloy under bi-axial deformation was investigated by deforming the sheet into a rectangular die cavity with and without lubrication. It was found that reducing the interfacial friction by use of a lubricant altered the metal flow after the deformed sheet had made contact with the die surface. Changes of the metal flow during forming not only developed a better thickness distribution of the formed part, but also improved cavitation distribution. The cavitation levels could be effectively reduced for forming with lubrication at a higher strain rate; the maximum cavity volume fraction decreased from 6.75 to 3.33% for forming at a strain rate of 110-3 s-1.

Keyword：Superplastic forming; Superplastic 5083 Al alloy; Lubrication; Cavitation