

Cavitation characteristics of a superplastic 5083 Al alloy during gas blow forming

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Abstract

Cavitation behavior of a superplastic 5083 Al alloy during gas blow forming has been investigated by deforming the sheet into a die with a rectangular cavity. Cavitation characteristics could be separated into two stages. In stage I; the sheet deformed freely as part of a hemi-cylindrical shape, cavity volume increased exponentially with deformation. The evolution of cavity volume was due to both nucleation and growth of cavities. In the second stage; the surface friction would restrict thinning of the sheet, and the cavity volume first increased and then decreased with forming time for all test forming rates. Decrease in cavity volume in the later stage could be related to the cavity shrinkage rising from sintering effect. A higher strain rate utilizing a higher imposed pressure during blow forming led to a greater average cavity shrinkage rate.

Keyword : Cavitation, Cavity shrinkage, Cavity growth rate parameter, Plane strain, Superplastic 5083 Al alloy, Superplastic forming