

Superplastic micro-forming with a fine grained Zn-22Al eutectoid alloy
using embossing technology

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Abstract

A novel micro-forming method, combining a metal's superplastic behavior with hot embossing technology, has been developed for manufacturing micro components from a fine-grained Zn-22Al eutectoid alloy. The forging characteristics of this alloy have also been studied using a Gleeble simulation machine.

Experimental results indicated that neither fiber-flow lines nor internal cracks could be observed when the fine-grained Zn-22Al eutectoid alloy was forged at a temperature range from 150°C to 200°C under a compressive strain rate range from 0.6 to 0.006 s⁻¹. A good dimensional accuracy for a mini compound spur gear was obtained by using hot embossing technology. Finally, a 5:1 mini reduction gear train was assembled. Its rotational motion was very continuous and smooth, indicating that the micro-forming method is a suitable technology for manufacturing micro metal components for Micro Electro Mechanical Systems (MEMS).

Keyword : Zn-22Al alloy, superplasticity, micro-forming, hot embossing technology