Variable-Shape Extrusion of Aluminum Square Pipes Using DLC Coated Dies

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(Received 31 May 2004; accepted 4 August 2004)

Key words: extrusion, aluminum, variable shape, square pipe, DLC coating

An aluminum space frame is a candidate structure for car bodies in the near future because of its light weight as well as high strength. To omit the secondary forming process in the production of an aluminum space frame, a variable-shape-extrusion apparatus with either a tapered mandrel or a step mandrel and movable dies, including four movable blocks, was developed, and experiments to investigate the characteristics of hot extrusion have been conducted using the apparatus. Results of the experiments indicated that the step mandrel provided good dimensional accuracy because its bearings are parallel to the extrusion direction. On the other hand, it was also found that pickup occurred easily on the surface of the extruded material when the step mandrel was used. In this work, to prevent the sticking of aluminum, the dies were coated with diamond-like carbon (DLC) around their bearings, and it was confirmed that the DLC coating significantly improved the surface of extruded square pipes.

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