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# 主动径向液压路径对筒形件壁厚分布的影响

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摘 要：基于低塑性、大高径比铝合金板材零件成形需求，提出主动径向加压充液拉深技术，采用数值模拟和实验相结合的方法，对液压加载路径对5A06铝合金球底筒形件主动径向加压充液拉深壁厚分布的影响进行研究。应用基于LS-DYNA3D内核的动力显示分析软件ETA/Dynaform5.5，确定径向压力加载区间为15~35 MPa，在该区间内可以成形出壁厚分布较均匀、较大拉深比的铝合金球底筒形件。研究结果表明：在合理的液室压力和主动径向压力耦合加载路径的作用下，可有效地抑制零件球底部的过度减薄；在球底部和筒壁靠近底部的区域内壁厚减小，随着径向压力的增加，壁厚减小量降低，零件最薄处由半球与直壁相接处逐渐向球底转移。

关键字：5A06铝合金；充液拉深；主动径向压力；加载路径

# Effects of independent radial pressure loading paths on cup thickness distribution

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**Abstract:**Based on the forming need of aluminum alloy sheet parts with low plasticity and large height-diameter ratio, a new process of hydrodynamic deep drawing with independent radial pressure was proposed. The effects of loading paths on thickness distribution of the 5A06 aluminum alloy cylindrical cup with a hemispherical bottom were studied by numerical simulation and experiment. Employing the dynamic explicit analytical software ETA/Dynaform5.5 based on LS-DYNA3D, the range of loading radial pressure was determined initially to be 15-35 MPa, in which the aluminum alloy cylindrical cup with uniform thickness distribution and larger drawing ratio can be formed. The results indicate that under the reasonable match of chamber pressure, and independent radial pressure the serious thinning at the bottom of hemisphere can be effectively restrained. At the area of hemispherical bottom and the straight-wall close to the bottom, the thickness reduces. The thinning ratio of thickness reduces and the minimum thickness area of part moves from the region between hemispherical bottom and straight-wall down to the bottom gradually with the increase of radial pressure.

**Key words:**5A06 aluminum alloy; hydrodynamic deep drawing (HDD); independent radial pressure; loading

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