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Analysis of Real Contact Area and Re-lubrication in Oscillating Bulk Forming Process by Corrosion Method

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Abstract

Oscillating method has been applied to bulk forming process due to the load reduction and high yield. The main cause of load reduction is the rebuilding of lubricating film during the back stroke of the die. A chemical corrosion method using an oscillating T-shape compression (OTC) test was employed to analyze re-lubrication and real contact area (RCA) in oscillating bulk forming process. Conventional T-shape compression (CTC) test and OTC test with three different frequencies were compared. Moreover, lubrication in compression and extrusion, which are two typical plastic deformations in T-shape test, were analyzed separately. The differences in RCA and re-lubrication were analyzed by optical microcoordinate measurement (OMC) and confocal scanning laser microscopy (CSLM). The mixed lubrication condition and re-lubrication degree were analyzed by measuring 3D roughness parameters and specimen geometry. By applying the corrosion method, the two main problems (i.e., the effective re-lubrication observation and the actual friction condition under load) can be expressed by the different degrees of corrosion. Re-lubrication was confirmed by the chatter marks expanding in the circumferential direction. Unlike

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