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Material deformation in equal channel forward extrusion process

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Abstract

Equal channel forward extrusion (ECFE) is a new method for producing Ultra-Fine Grained (UFG) materials. In this paper, material deformation of pure aluminum in the ECFE process is studied. To this end, firstly, the process is applied to the material and some results such as experimental force and is extracted. Then, the experimental result are used to verify the numerical method which is utilized to evaluate the effect of ECFE die parameters such as main deformation zone height and length to width ratio on the strain and stress distribution, as significant parameters on the die design. To analyze the stress and strain distribution, two planes of the pressed sample, during the ECFE process have been considered. Finally, effect of ECFE parameters on the pressing force as a driving factor has been presented. The results show that effective strain is increased about 300% by increasing length to width ratio about 85.7%. In addition, the lower the length to width ratio applied in ECFE process, the more strain homogeneity is observed. © EDP Sciences, 2017.

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