

Documents

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On a novel severe plastic deformation method: severe forward extrusion (SFE)

(2017) *International Journal of Advanced Manufacturing Technology*, 93 (1-4), pp. 1041-1050. Cited 2 times.

Abstract

Severe plastic deformation is a process in which high strain is applied to the samples to improve its mechanical properties. In this research, a new severe plastic deformation method which is based on forward extrusion process is presented to improve mechanical properties of materials, by reducing pressing force and increasing strain uniformity. Also, achieving high-strength materials with bigger size which can meet the industry is another goal of this new method. Initially, the process and related die design are introduced. Then, effects of the severe forward extrusion process on the aluminum mechanical properties such as material strength, hardness, fractographic analysis, and fatigue behavior are evaluated. Next, by using finite element method, some effects of die parameters on the pressing force and strain are studied. Finally, the obtained results show that the yielding stress is increased about 108%, by applying six passes of severe forward extrusion process. Also, the hardness value after sixth pass is greatly increased about 203%. In addition, the fatigue test results show that the endurance limit is improved 123% after sixth pass. © 2017, Springer-Verlag London.

2-s2.0-85020125218

Document Type: Article

Publication Stage: Final

Source: Scopus