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Experimental investigation of ultrasonic assisted equal channel angular pressing process

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Abstract

Improvement of equal channel angular pressing (ECAP) efficiency is an important challenge for industrialization of this technique. The reduction of pressing load and improvement of material mechanical properties are among the most challengeable subjects during this process. In this research, commercial pure aluminum has been ECAPed at room temperature using conventional and ultrasonic vibration techniques to investigate the influence of ultrasonic wave on the pressing load and mechanical characteristics of deformed samples. The results showed that the superimposing ultrasonic vibration on the ECAP process not only decreases the required punch load, but also improves the mechanical properties of the material as compared to the conventional condition. Interestingly, the ultrasonic vibration assisted process leads to about 16%, 10% and 12% increments at the yield strength, ultimate tensile strength and hardness value respectively and also, 9% reduction at the punch load. Furthermore, the dislocation density of the sample produced by ultrasonic assisted ECAP is about 35% more than the achieved conventional sample. © 2015 Politechnika Wroclawska.

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