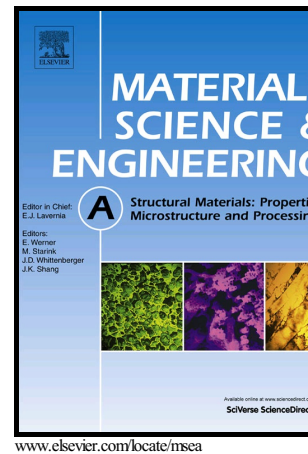


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**Feasibility of attaining uniform grain structure and enhanced ductility in aluminum alloy
by employing a beveled punch in equal-channel angular pressing**

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Abstract

The advantages of using a beveled-edge punch in equal-channel angular pressing are investigated. Lambda angle (λ), the clockwise angle between the theoretical shear plane and punch/billet interface, is used to demonstrate how the punch tip is inclined. Transmission electron microscope is used to assess the microstructure of the samples processed using a beveled-edge punch. In addition, tensile tests at elevated temperature are performed. The results show that using a beveled-edge punch ($\lambda=90^\circ$) in the process leads to formation of uniform subgrain structure and increases the tensile ductility for the samples at elevated temperature. In addition, finite element simulations are performed to study the correlation between measured properties and mechanism of material deformation by employing a beveled-edge punch. Numerical simulations confirm the irregular deformation in case of $\lambda=0^\circ$ and uniform strain distribution for $\lambda=90^\circ$, which were the main reasons of variation in mechanical properties.

Keywords: Equal-channel angular pressing; Finite element; Fracture surface; Grain size; Lambda angle; Thermo-mechanical behavior.

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