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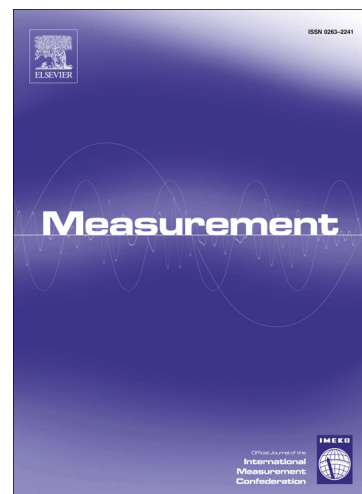
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**Investigation of direct extrusion channel effects on twist extrusion using experimental and finite element analysis**

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**Abstract**

Twist extrusion (TE) is a relatively new severe plastic deformation technique in which radial deformation is heterogeneously distributed in the sample. In this research, in order to achieve favorable properties, a direct extrusion (DE) channel was embedded after the twist zone at the bottom of the TE die. The plastic deformation behavior of aluminum alloy 6063 (AA6063) was investigated in the TE process, with and without the DE channel. AA6063 successfully underwent TE under the conditions designed using the finite element analysis. According to the simulation results, a very heterogeneous distribution of the equivalent plastic strain (PEEQ) was observed in TE, while the TE+DE simulation exhibited more homogeneous PEEQ in the central and lateral regions. Microstructural evolution analysis using scanning electron microscope and Vickers microhardness evaluations showed that utilizing the DE channel increased the hardness and provided a more homogenous microstructure. Moreover, tensile testing results indicated an increase in strength and enhanced mechanical properties of the TE+DE processed AA6063.

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