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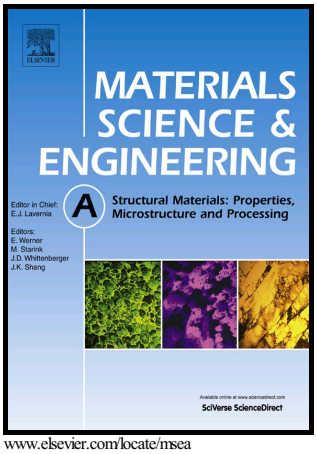

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Microstructural evolution and enhancement of mechanical properties of Al1050 by tubular channel angular extrusion

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Abstract

In this study, circular tubes of commercially pure aluminum (Al1050) have been processed by the tubular channel angular extrusion (TCAE) at room temperature, which is based on extruding a tube through the intersecting channels with a certain angle. The thickness of the wall of a circular tube is kept constant and is sheared twice with intersection angle, Φ while the outer and inner diameters of the tube are reduced during the process. A large amount of strain in the intersecting channel leads to grain refinement in the wall of circular tube. Microstructural evolution in the workpiece of circular tube during the process was examined by orientation imaging microscopy (OIM) using the electron back scattered diffraction (EBSD) technique integrated in high resolution SEM. Also the changes of mechanical properties via the TCAE process were studied by tensile tests and instrumented indentation. The test results demonstrate that mechanical property of the TCAEed Al1050 alloy such as the yield strength has been substantially improved about three times as much as the initial one with a single pass of TCAE, effectively, at room temperature.

Keywords: Tubular channel angular extrusion, circular tube, severe plastic deformation (SPD), ultrafine-grain (UFG).

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