

Experimental Study on Mechanical Properties of Commercially Pure Copper Processed by Severe Plastic Deformation Technique-Equal Channel Angular Extrusion

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Abstract : The experiments have been conducted to study the mechanical properties of commercially pure copper processing at room temperature by severe plastic deformation using equal channel angular extrusion (ECAE) through a die of 90° angle up to 3 passes by route B_C i.e. rotating the sample in the same direction by 90° after each pass. ECAE is used to produce from existing coarse grains to ultra-fine, equiaxed grains structure with high angle grain boundaries in submicron level by introducing a large amount of shear strain in the presence of hydrostatic pressure into the material without changing billet shape or dimension. Mechanical testing plays an important role in evaluating fundamental properties of engineering materials as well as in developing new materials and in controlling the quality of materials for use in design and construction. Yield stress, ultimate tensile stress and ductility are structure sensitive properties and vary with the structure of the material. Microhardness and tensile tests were carried out to evaluate the hardness, strength and ductility of the ECAE processed materials. The results reveal that the strength and hardness of commercially pure copper samples improved significantly without losing much ductility after each pass.

Keywords : equal channel angular extrusion, severe plastic deformation, copper, mechanical properties

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