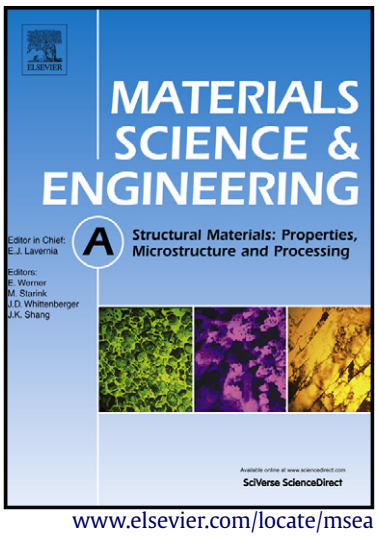


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# Texture evolution and enhanced grain refinement under high-pressure-double-torsion

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## Abstract

We present a severe plastic deformation process called high-pressure-double-torsion (HPDT) for grain size refinement in metallic polycrystals. Like standard high-pressure torsion, HPDT monotonically imposes extreme plastic strains (>> 10) but via rotating both ends of the sample rather than one. Commercial purity Cu was subjected to HPT and HPDT for 1, 2, and 4 turns. The grain structure, hardness, and crystallographic texture were examined by transmission electron microscopy (TEM), Vickers microhardness tests, and X-ray diffraction (XRD) in both processes and compared in the mid radius and at the edge of the disks. We report that HPDT leads to finer grain sizes and higher hardness than HPT for the same number of turns. The measured textures exhibit the typical shear components, which continuously strengthened with the plastic strain and also weakened with extreme grain refinement. These measurements also indicate that the texture gradients are lower in HPDT than HPT.

*Keywords:* Severe plastic deformation; Grain size; Texture; Finite element analysis



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