

## **Effect of Die Design on Microstructure and Mechanical Properties of Pure Copper**

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### **Abstract**

‘Constrained Groove Pressing’ (CGP) is a severe plastic deformation (SPD) technique for the fabrication of ultra-fine grained metallic sheets. The major advantage of this technique is that it does not bring out any dimensional changes in the workpiece. The design of CGP dies is of huge importance for the evolution of microstructure and mechanical properties of materials. Various studies showed that CGP processed metal sheets show improvement in various mechanical properties. However, literature also reports that hardness values show non-uniformity at the micro-level. Recent studies correlate this non-uniformity in mechanical properties at a small length scale to microstructural inhomogeneity. This microstructural inhomogeneity occurs due to sharp edges of CGP die where shear, as well as bending strain, is present and the remaining region of material experiences only shear strain. In this work, we aim to alleviate this inhomogeneity in microstructure and the resulting anisotropy in mechanical properties by modifying and optimizing the design of the die.

**Keywords:** *SPD, CGP, Inhomogeneity*