Investigation of Microscale Plastic Deformation Behavior of Copper Microgear in Forward Microextrusion Process

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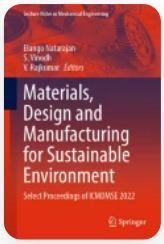

Materials, Design and Manufacturing for Sustainable Environment

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Abstract

Microgears are critical components in the field of manufacturing complicated micro-devices for precise motion control that require lightweight, high-dimensional accuracy, and optimum performance under variable environments. Continuous demand of microcomponents has speeded up the need of producing microgears with high quality and economically from different materials. Microforming process offers a good quality of formed parts with low cost and high productivity. In this work, the deformation behavior of copper microgear is investigated under two different forming conditions. The results show that microgears extruded with high temperature resulted in good formability and improved dimensional accuracy. Microhardness measurements exhibit an inhomogeneous deformation pattern as the hardness at the center is higher when compared with the tooth. Significant reduction in microhardness and coefficient of variation were observed in the specimens formed with temperature assistance. The outcome of the current research will definitely contribute to the fundamental understanding of microextrusion of copper and enhance development microgears in a larger scale.