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Microstructure Evolution during Severe Shear Deformation at Small Length-Scales

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Abstract

Evolution of microstructures during severe shear in micrometer scale sample sizes is examined by performing large strain machining experiments inside a scanning electron microscope. The effect of depths of cut ranging from 10–1 μ m on the mechanics is examined using digital image correlation of secondary electron images. Resulting microstructure is characterized via electron backscattered diffraction, which shows that with shrinking length-scales gradual microstructure refinement observed at higher depths of cut is replaced by abrupt but sporadic refinement mechanisms.

Keywords: deformation structure, ultrafine grained microstructure, severe plastic deformation (SPD), scanning electron microscopy

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