Formation and subdivision of deformation structures

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Formation and subdivision of deformation structures

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During plastic deformation of metals and alloys, dislocations arrange in ordered patterns. How and when these self-organization processes take place has remained elusive, as *in situ* observations have not been feasible. Here we present an X-ray diffraction method, providing data on the dynamics of individual, deeply embedded dislocation structures.[1] First results relate to the tensile deformation of pure copper. Structural elements with a size of 1 μm are found to form during deformation already at 0.4 % strain. Unexpectedly, the dislocation-free regions show intermittent dynamics, e.g. appearing and disappearing with proceeding deformation, even displaying transient splitting behaviour. Insight into these processes is vital for optimizing the strength and mechanical performance of deformed materials as well as an understanding of work-hardening.

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[1] B. Jakobsen *et al. Science* (2006), *in print.*

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