Size-dependent plasticity in contact/friction: from discrete dislocation dynamics inside an asperity to statistical summation over asperities

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Propositions

accompanying the dissertation

SIZE-DEPENDENT PLASTICITY IN CONTACT/FRICTION: FROM DISCRETE DISLOCATION DYNAMICS INSIDE AN ASPERITY TO STATISTICAL SUMMATION OVER ASPERITIES

by

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1. When dislocation sources in annealed pillars under compression are stronger than obstacles, plastic deformation is source controlled and there is no size effect of the yield strength. When obstacles are stronger than dislocation sources, plastic deformation is controlled by dislocation depinning and yield becomes size dependent. (Chapter 3)

2. The pressure distribution on a rough surface under contact strongly depends on the plastic properties of the material. However, when the material remains elastic, the distribution is universal. (Chapter 4)

3. The Greenwood-Williamson (GW) statistical model is able to provide a similar size dependent behavior as full detailed FEM results when the estimate of the surface GW parameters is representative of the simulated surface asperities. (Chapter 5)

4. The onset of sliding between two surfaces can be caused by decohesion, by plastic deformation, or by both. Not only the length scale influences the real mechanism of the onset of sliding, but also the external loading rate. (Chapter 6)

5. Due to size dependent plasticity, the force to plastically deform different sizes of self-similar asperities is size independent. (Chapter 7)

6. You can already know in primary school who of your friends will live longer by doing an IQ test.