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DISCRETE DISLOCATION PLASTICITY ANALYSIS OF CONTACT BETWEEN A SINUSOIDAL AND A FLAT METAL SURFACE

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Contact between a sinusoidal and a flat metal surface is investigated using discrete dislocation plasticity simulations [1]. The focus of this study is on capturing the possible size dependent response of the sinusoidal asperities. Previous work involving flattening of a a sinusoidal metal surface by a rigid platen [2] demonstrates the occurrence of two different size effects, i.e plasticity is a function of asperity size as well as of asperity spacing, when these length are in the micrometer range. If the sinusoidal surface is flattened by a metal platen that can also deform plastically by dislocation motion, such size effects are expected to be different. This study aims at pointing out the differences.

Contrary to our previous simulations, where the effect of the rigid body on the metal crystal was modeled through boundary conditions directly applied to the metal surface, in these simulations both bodies in contact are modeled. This is a major improvement because now, dislocations can leave the crystal through the contact region, naturally leaving a displacement step on the metal surface.

The contact simulations will keep track of the mean as well as the local contact pressure, the evolution of the true contact area and the stress distribution in the contacting bodies. Results of these simulations will bring us a step closer to understanding contact between rough metal surfaces.

References

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