Abstract Submitted
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Adhesive contact of randomly rough surfaces LARS PASTEWKA, MARK ROBBINS, Johns Hopkins University — The contact area, stiffness and adhesion between rigid, randomly rough surfaces and elastic substrates is studied using molecular statics and continuum simulations. The surfaces are self-affine with Hurst exponent 0.3 to 0.8 and different short λ_s and long λ_L wavelength cutoffs. The rms surface slope and the range and strength of the adhesive potential are also varied. For parameters typical of most solids, the effect of adhesion decreases as the ratio λ_L/λ_s increases. In particular, the pull-off force decreases to zero and the area of contact $A_c$becomes linear in the applied load L. A simple scaling argument is developed that describes the increase in the ratio A_c/L with increasing adhesion and a corresponding increase in the contact stiffness [1]. The argument also predicts a crossover to finite contact area at zero load when surfaces are exceptionally smooth or the ratio of surface tension to bulk modulus is unusually large, as for elastomers. Results that test this prediction will be presented and related to the Maugis-Dugdale [2] theories for individual asperities and the more recent scaling theory of Persson [3]. [1] Akarapu, Sharp, Robbins, Phys. Rev. Lett. 106, 204301 (2011) [2] Maugis, J. Colloid Interface Sci. 150, 243 (1992) [3] Persson, Phys. Rev. Lett. 74, 75420 (2006)

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