

Abstract Submitted  
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**Stiffness of Contacts of Self-Affine Surfaces**<sup>1</sup> TRISTAN A. SHARP,  
MARK O. ROBBINS, SREEKANTH AKARAPU, Johns Hopkins University — The  
presence of roughness on a wide range of scales has a profound effect on the contact  
area and interfacial stiffness between contacting surfaces. In turn, the interfacial  
stiffness dominates the response of many macroscopic systems. Molecular dynamics  
simulations are used to characterize contacts between self-affine fractal surfaces with  
different roughness exponents. A unified framework describes the relation between  
roughness, system size, surface separation, stiffness, and contact area for a wide  
variety of systems. The contact area and normal stiffness rapidly approach Persson's  
continuum theory with increasing system size [1]. The lateral stiffness and friction  
are much more sensitive to atomic-scale effects. Atomic scale displacements at the  
interface can greatly reduce lateral stiffness and may explain the low lateral stiffness  
observed in some experiments.

[1] B. N. J. Persson Phys. Rev. Lett. 99, 125502 (2007).

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