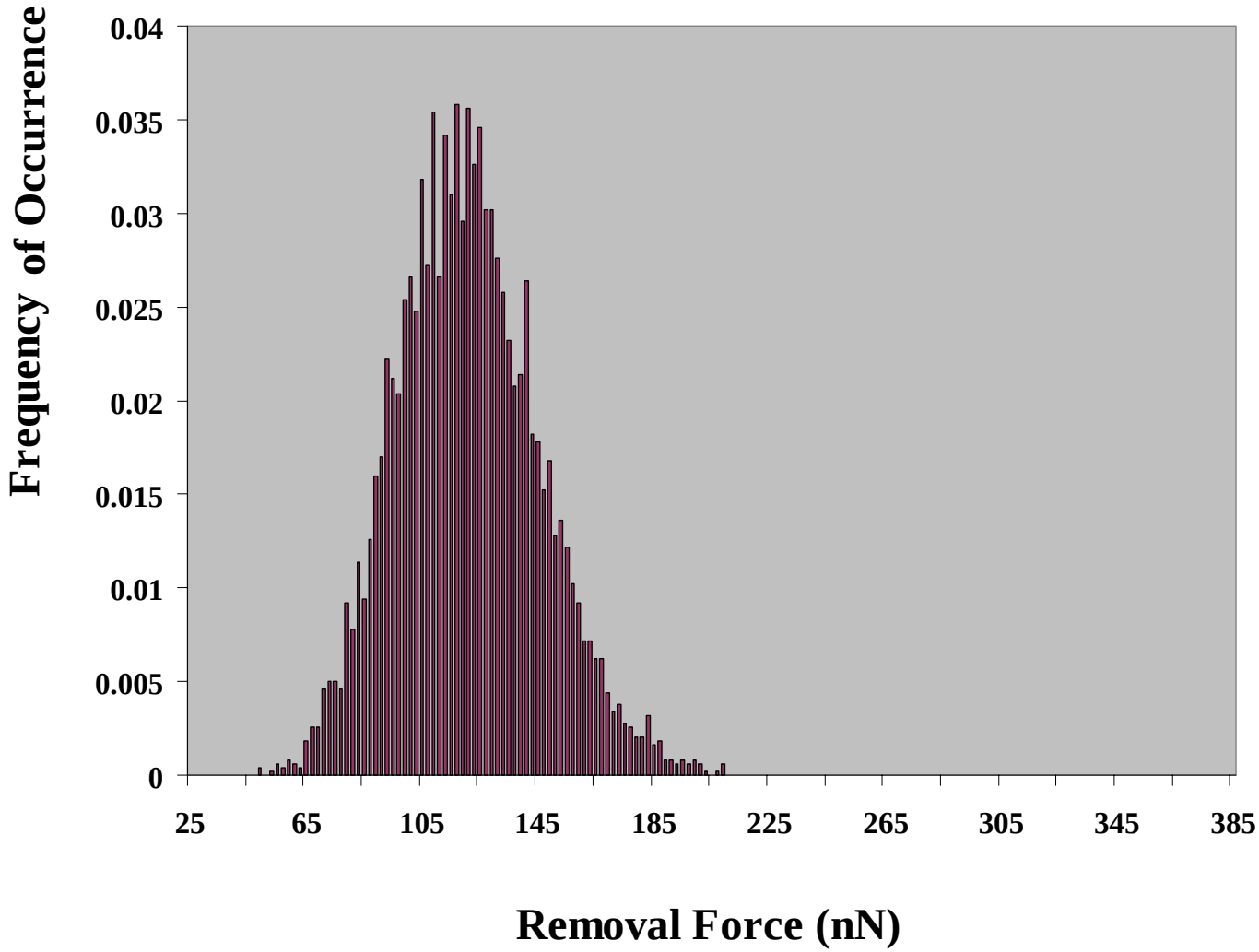
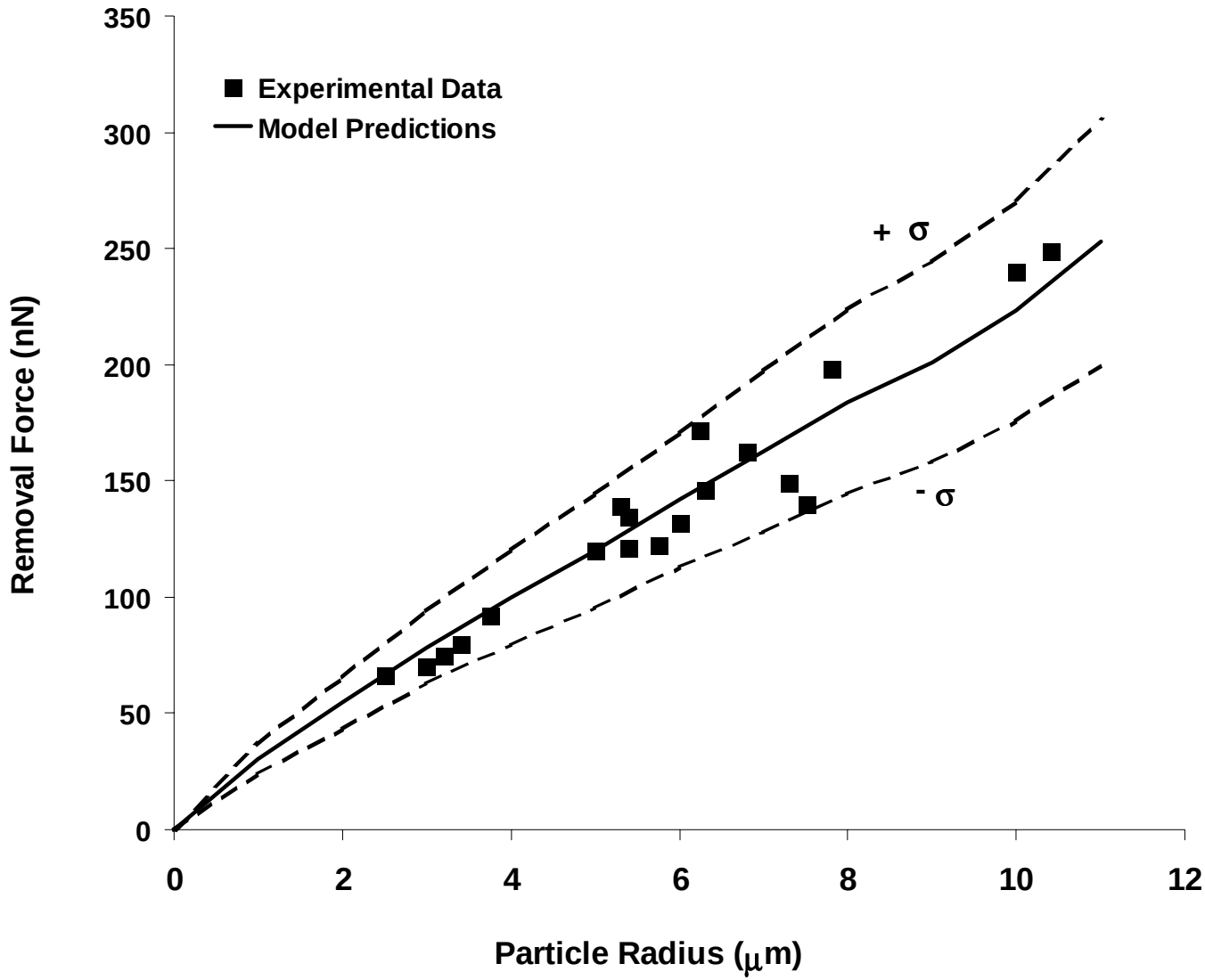
Simulation Prediction

* 5 μm PSL in contact with a silicon substrate in water

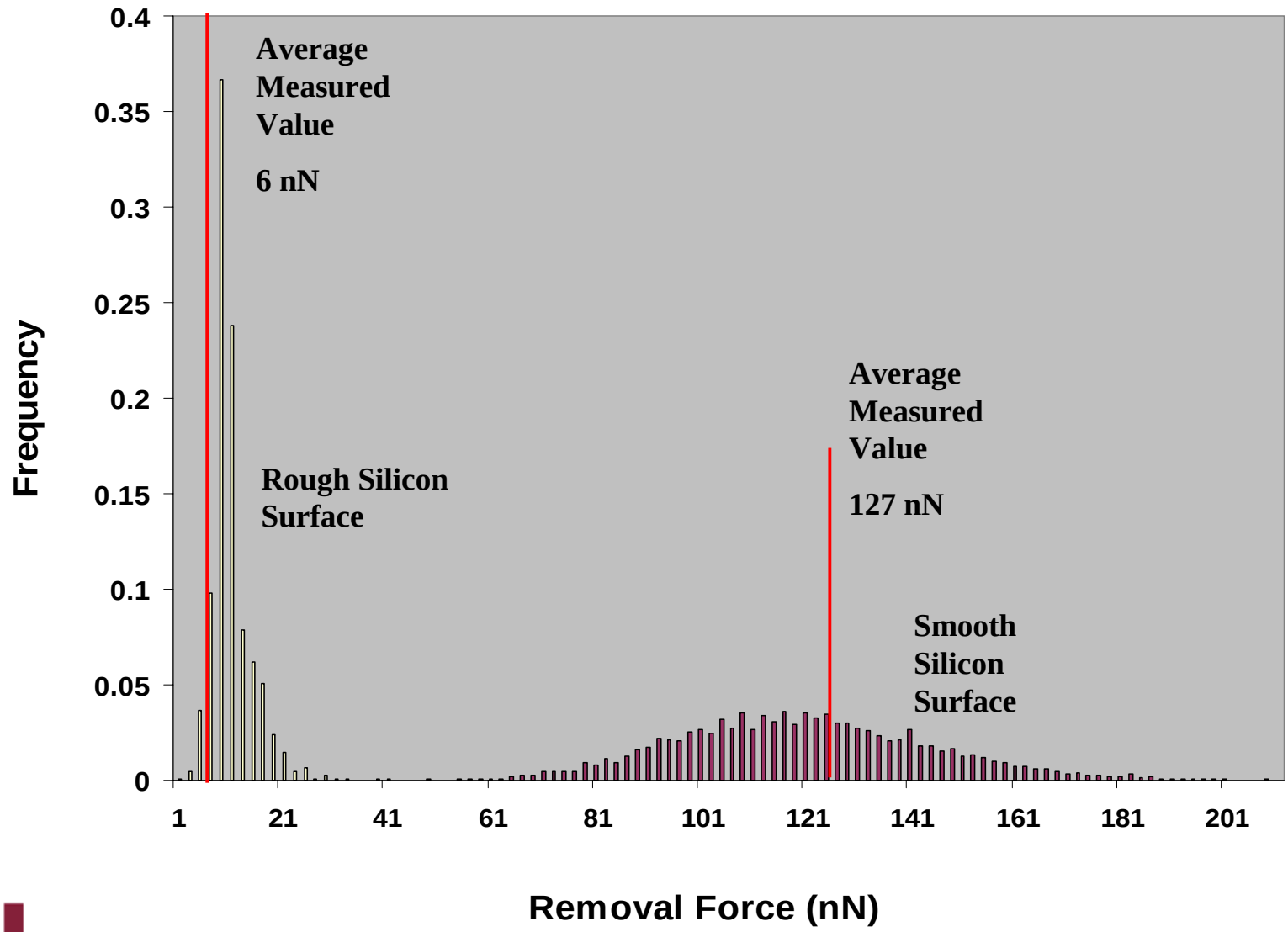


Simulation Prediction

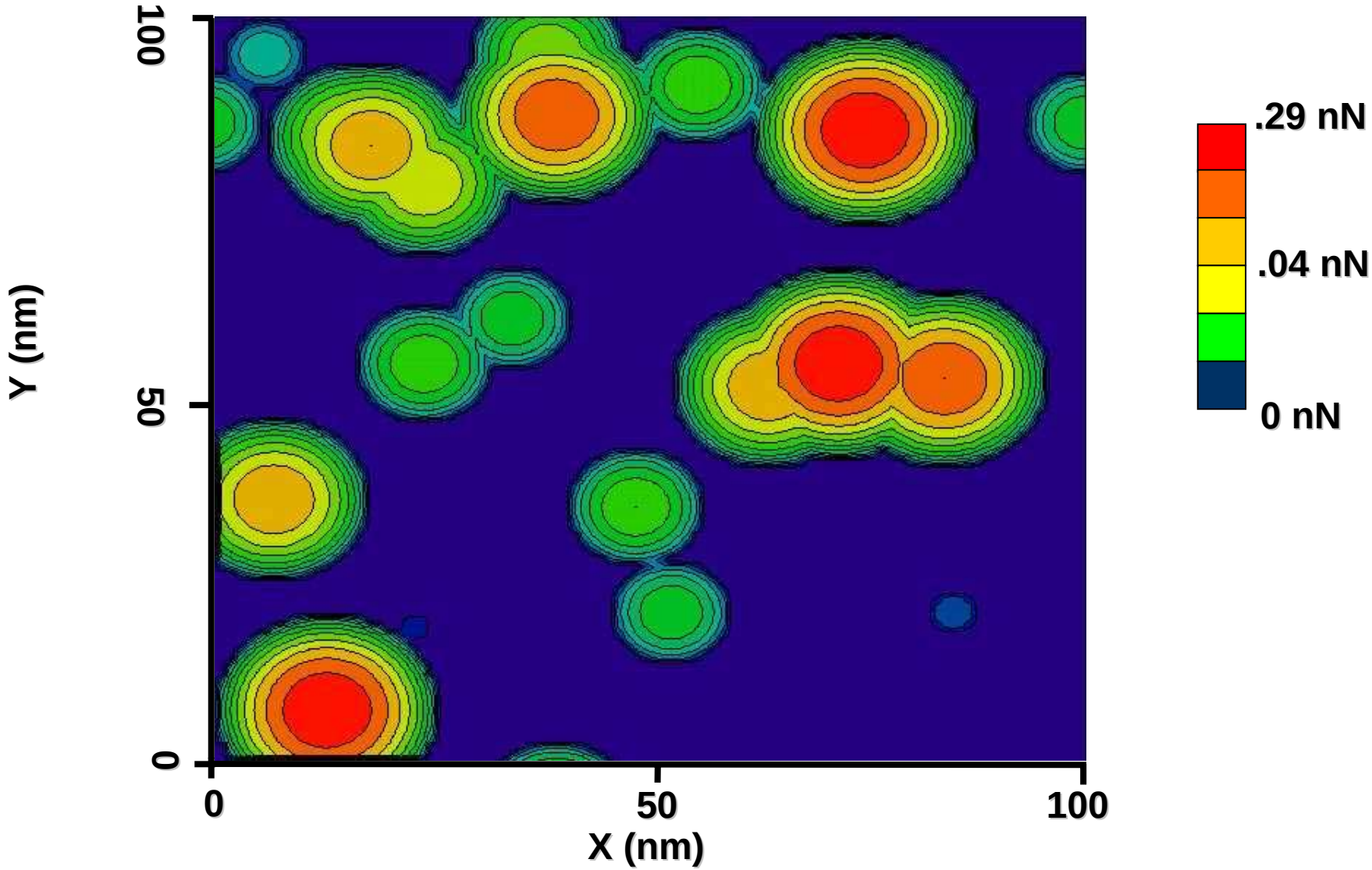
* PSL colloids in contact with a silicon substrate in water



Simulation Prediction

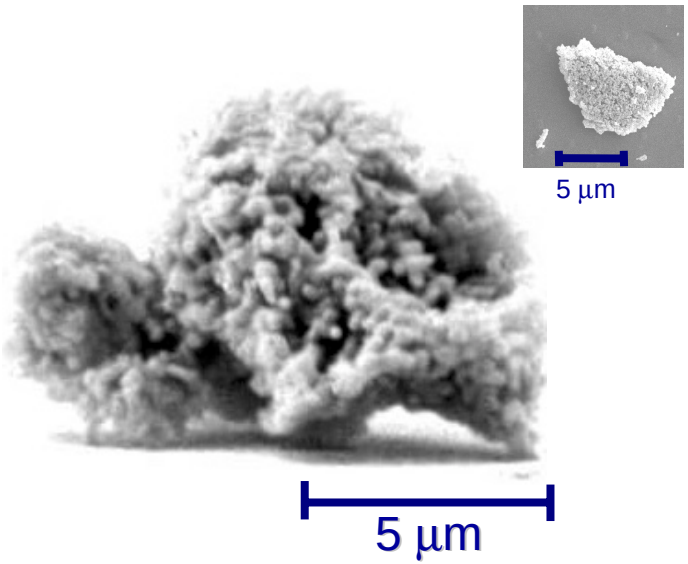


Localized Particle Force

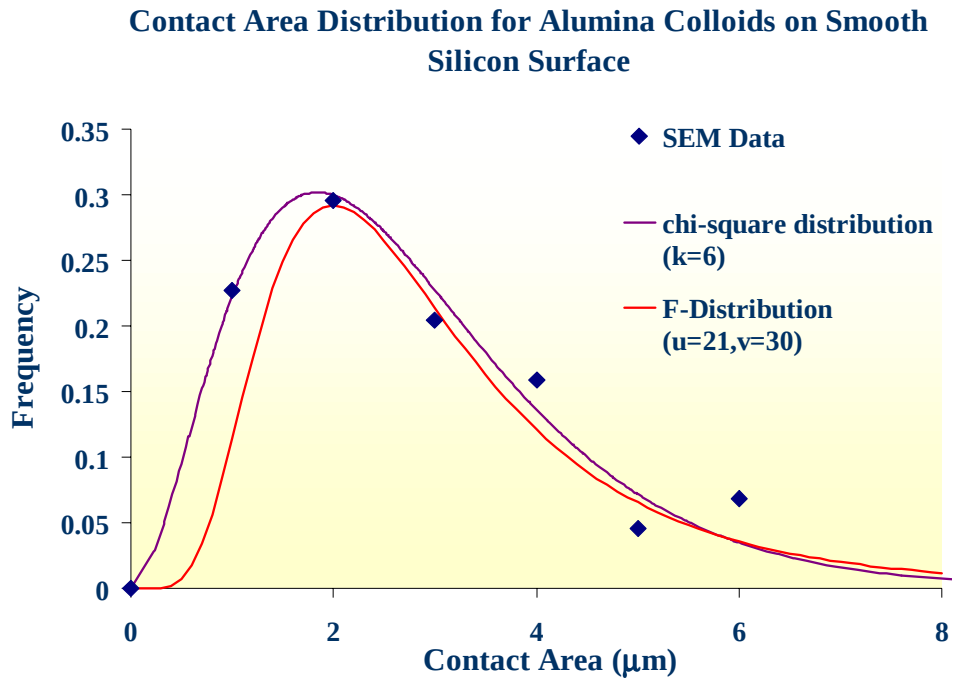


Force Contour for PSL colloid interacting with smooth Si surface (in water)

Predictions - 2nd Generation Model



SEM of an alumina colloid on a polished silicon substrate (15 KeV, 10000X, 87 degrees)



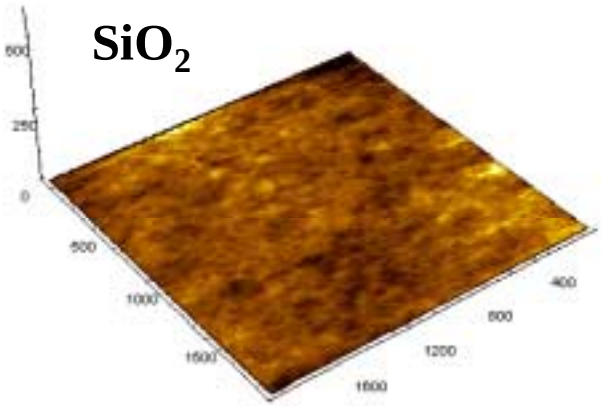
Current vdW models for a spherical 0.15 µm alumina particle (slurry particle) in contact with a silicon surface predict a removal force of

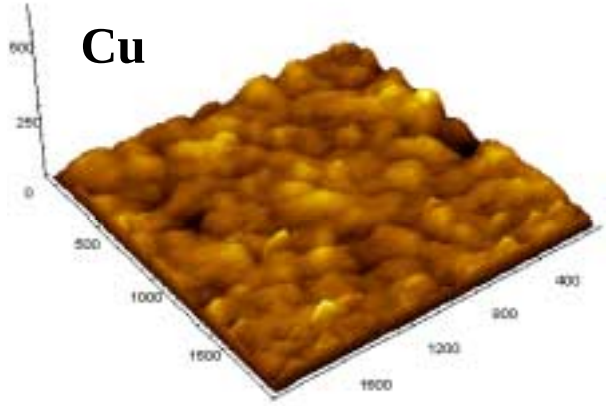
15nN

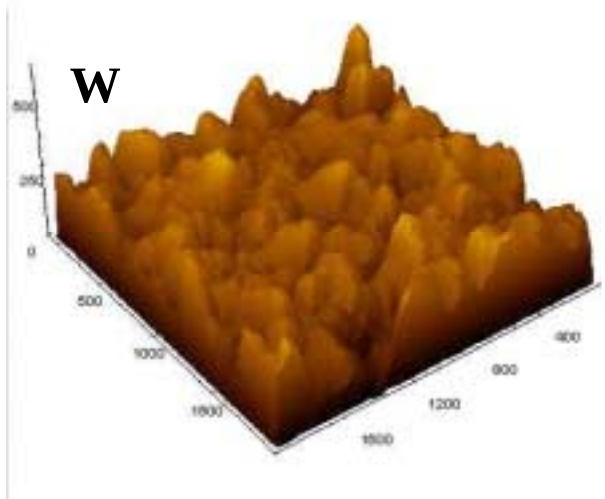
Our simulation accounting for the larger than expected contact area predicts a removal force of

108 nN

Surface Characterization







Material	ε_s (nm)	Std (nm)	Frac. Coverage
SiO_2	1.7	0.7	0.01
Cu	53.8	25.2	0.33
W	139.8	78.1	0.80
Al_2O_3 particle	1.6	0.7	0.03