

## Shape-dependent Adhesion and Friction on Au Nanoparticles Probed with Atomic Force Microscopy

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Shape control of metal nanocrystals has broad applications, including catalysis, plasmonics, and sensing. It was found that controlling the atomic arrangement on metal nanocrystal surfaces affects many properties, including the electronic dipole or work function. Tuning the surface structure of exposed facets of metal nanocrystals was enabled by shape control. We investigated the effect of shape on nanomechanical properties, including friction and adhesion forces. Two nanoparticles systems, high-index {321} and low-index {100}, were used as model nanoparticle surfaces. Scanning force microscopy was used to probe nanoscale friction and adhesion. Because of the abundant presence of high-density atomic steps and kinks, high-index faceted nanoparticles have a higher surface energy than low-index faceted cubic nanoparticles. Due to this high surface energy, high-index faceted particles have shown stronger adhesion and higher friction than low-index nanoparticles. We discuss the results in light of the differences in surface energy as well as the effect of capping layers in the measurement.

**Keywords:** Scanning Force Microscopy, Friction, Adhesion, Au nanocrystal, Shape control, Surface energy