

Investigation of Rolling and Sliding Nanometer Scale Objects

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This work seeks to discover how the method by which sustained translations of nanoscale particles across their abutting surfaces is determined by their material properties – can we predict whether a given particle will slide or roll? We are testing the hypothesis that the linear dimensions, interfacial surface energy, and elasticity determine the tendency to slide versus roll when lateral forces are applied to nanoscale spherical objects. The interplay between these properties determines the transition point where a rolling mode of translocation (preferred for macroscopic objects) changes to a sliding mode. It is this transition point as a function of the stated variables that we seek to map and model.

We are using the shear forces generated by flowing fluids in microfluidics channels to translate asymmetric, nanoscale particles of controlled size, surface chemistry, and moduli. Relative motion of fluorescent markers is being used as a test for rolling.



Rolling or Sliding?

