Probing the Self-Assembly and Nonlinear Friction Behavior of Confined Gold Nano-Particles

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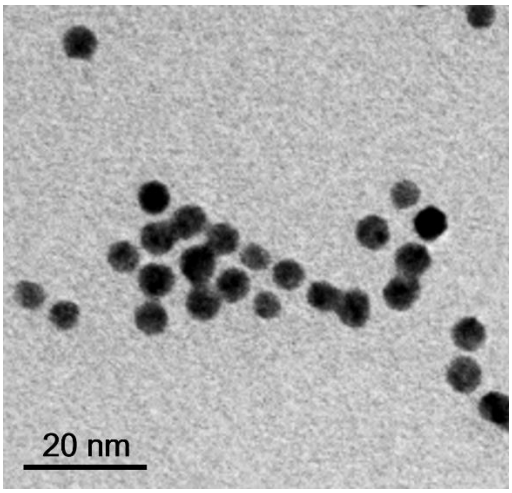

Figure S1. Typical transmission electron microscopy images of Au NPs purchased from Cytodiagnostics Inc.

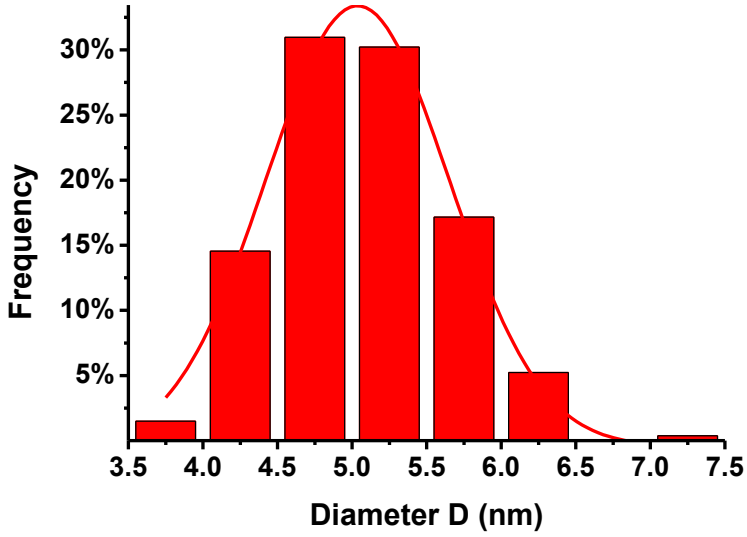

Figure S2. Histograms and the fitted Gaussian distributions of measured size of Au NPs （~ 270 particles）used in this work.

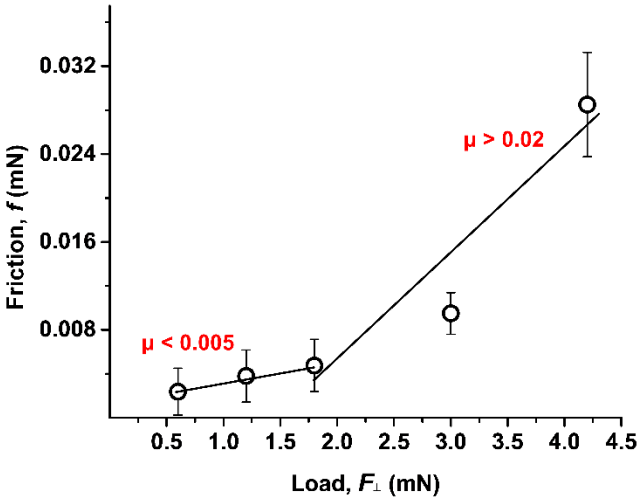

Figure S3. Friction force (f) as a function of normal load ($F\perp$) for two mica surfaces injecting Au nanoparticles, the shear velocity v = 140 nm/s

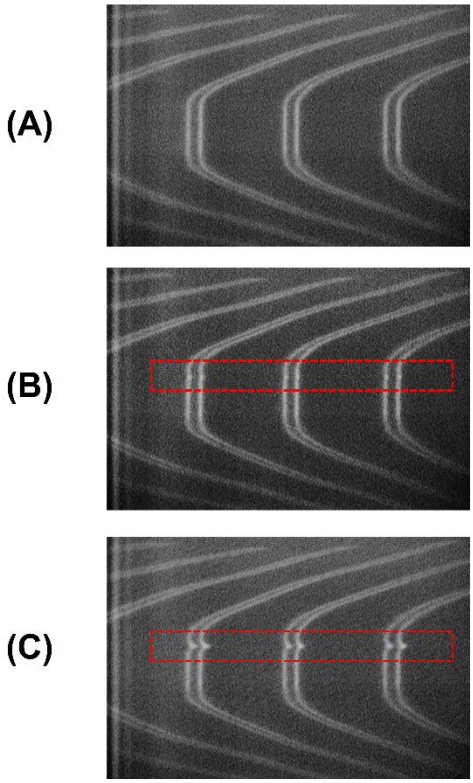

Figure S4. The change of FECO images during continuous sliding ($F\perp$ > 0.6 mN), the deformation shown in C proved the damage of mica substrate at the sliding zone,

The equations used for calculating Debye length (λ_D) are shown in Equation S1-S2 as follows,[1]

$$\lambda_D = \sqrt{\frac{\varepsilon_r \varepsilon_0 k_B T}{N_A q_0^2 I}} \quad \text{(S1)}$$

$$I = \frac{1}{2}\sum_{i=1}^{n} M_i z_i^2 \quad \text{(S2)}$$

where ε_r is the relative permittivity of the aqueous medium, ε_0 is the vacuum permittivity, T is the temperature in Kelvin, k_B is the Boltzmann constant, N_A is the Avogadro's number, q_0 is the elementary electric charge, n is number of ion species in the solution, I represents the ionic strength of the electrolytic buffer solution, and M_i and z_i represent the ion concentration and the number of ion charge, respectively.

References

1. Israelachvili, J. N., *Intermolecular and Surface Forces*. Academic press: 2011; p 704.