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Single Electron Tunneling to Individual Gold Nano-Particles NING ZHENG, Physics Dept, GANGLI WANG, Chemistry Dept, EZRA BUSSMANN, Physics Dept, LIN ZHAO, Physics Dept, CLAYTON WILLIAMS, Physics Dept, Univeristy of Utah — Single electron tunneling to naked gold clusters and monolayer protected gold clusters on a thermally grown silicon dioxide film has been performed by single-electron tunneling force microscopy (SETFM) at room temperature.[1,2] In this technique, single electron tunneling events are detected by electrostatic force measurement. We observe several abrupt steps in the smooth frequency shift curve as the tip approaches a cluster. These steps correspond to single or multiple electron tunneling events to the gold particle. Since the tunneling electron changes the charge on the particle, it is also detected as a change in surface potential. The electron can be manipulated to and from the gold particle by changing the voltage applied to the tip. These tunneling events can be used to determine the electronic structure and charging energy of the individual gold particle. The technique will be described and the single electron tunneling results will be discussed. A theoretical model of the tunneling measurements is in agreement with the measurements.

[1] E. Bussmann, D. J. Kim, and C.C. Williams, *Appl. Phys. Lett.* **85**, 2538 (2004)
[2] E. Bussmann, N. Zheng, and C.C. Williams, *Appl. Phys. Lett.* **86**, 163109 (2005)

Ezra Bussmann

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