Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Simultaneous Measurements of Force and Conductance through Single Molecular Junctions[1] MICHAEL FREI, MARIA KAMENETSKA, MAX KOENTOPP, MARK S. HYBERTSEN, LATHA VENKATARAMAN, Columbia University and CFN, Brookhaven National Laboratory — Simultaneous conductance and force measurements of single molecule junctions are performed by repeatedly forming and breaking junctions between a molecule coated gold substrate and a gold-coated cantilever in a simplified atomic force microscope (AFM). We show that the forces required to break the molecular junctions in the case of 1,4 diaminobutane and 1,4 bis (methyl thiol) butane are significantly smaller than the breaking force of a single atom gold contact. This indicates a breaking of the Au-N and Au-SMe bond respectively. Data for 1,2-bis(dimethyl phosphino) ethane differs significantly. We find that the force required to break the molecular junction is comparable to that required to break a gold-gold bond. We find further that for a significant fraction of the traces measured, the molecular junction conductance often drops by an order of magnitude, while the forces do not change significantly. We will discuss the implications of these findings and show how they relate to detailed simulation of the junction elongation process for these links.

[1]Support: NSF-CHE-074418.

Michael Frei

Date submitted: 29 Nov 2008 Electronic form version 1.4