Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Electronic Transport in Molecularly-Linked Gold Nanoparticle Films Near the Metal-Insulator Transition. AL-AMIN DHIRANI, JEFFREY DUNFORD, YOSHINORI SUGANUMA, Department of Chemistry, University of Toronto — We have investigated the temperature (T) dependence of the conductance (g) of 1,4-butane dithiol linked Au nanoparticle films. Over a wide range of temperatures (20 K to 300 K), the conductance behaves as $g = g_0 \exp(-(T_0/T)^{1/2}))$. Such a temperature dependence is predicted by an Efros-Shklovskii variable-range hopping model based on a competition between Coulombic and inter-cluster tunneling processes. However, we find that hopping distances are too large (62 nm to 720 nm at 100 K) to be consistent with tunneling between clusters, and tend to scale with cluster size. We propose a modified "quasi-localized hopping" model based on competition between single-electron cluster charging and intra-cluster electron backscattering to explain this temperature dependence.

Al-Amin Dhirani
Department of Chemistry, University of Toronto

Date submitted: 06 Dec 2005 Electronic form version 1.4