Abstract Submitted
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Controlled Fabrication of Nanogaps for Molecular Electronics[1] D. R. STRACHAN[2], D. E. SMITH, D. E. JOHNSTON, A. T. JOHNSON, Dept. of Physics and Astronomy, Univ. of Pennsylvania, D. A. BONNELL, Dept. of Materials Science and Engineering, Univ. of Pennsylvania, T.-H. PARK, S. P. WU, M. J. THERIEN, Dept. of Chemistry, Univ. of Pennsylvania, F. V. COCHRAN, W. F. DEGRADO, Dept. of Biochemistry and Molecular Biophysics, Univ. of Pennsylvania — We have developed a controlled and highly reproducible method of making nanometer-spaced electrodes using electromigration in ambient lab conditions. This advance has several advantages over the typical method at liquid-helium temperatures. One advantage is that it will make feasible electrical measurements of molecules that do not survive a sub-freezing environment. A second advantage is that it yields nanogaps of desired tunneling resistance, as opposed to the random formation at liquid-helium temperatures. We discuss how the nanogap evolves through three regimes – a bulk-neck regime where electromigration is triggered at constant temperature, then a few-atom regime characterized by quantized plateaus in the conductance, and finally to a tunneling regime across the nanogap once the conductance falls below the conductance quantum ($G_o = 2e^2/h$). We end with a discussion on the electronic properties of molecules measured using the new electrodes.

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