Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

On the electronic transport in doped polyaniline/polyethylene oxide nanofibers prepared via electrospinning NATALYA A. ZIMBOVSKAYA, UPRH, ALAN T. JOHNSON JR., UPENN, NICHOLAS J. PINTO, UPRH — We fabricate and electrically characterize electrospun nanofibers of doped polyaniline/polyethylene oxide. Scanning conductance microscopy shows that fibers with diameter below 15 nm are electrically insulating. Single fiber I-V characteristics show that thin fibers conduct more poorly than thick ones and fibers with large asymmetry along their length between the electrical contacts show rectifying behavior [1]. A theoretical analysis of the conductance in the polymeric nanofibers is presented. The analysis is based on the model of a granulated metal [2], so the polymeric material is treated as a network of small metallic-like domains made out of densely packed polymeric chains embedded in an amorphous array of disordered chains. Assuming the electronic transport to be provided by the electron tunneling between the metallic grains through the intermediate resonance states, the theory of conductance in molecular wires [3] is employed to calculate the tunneling current. It is shown that nonlinear features in the I-V curves could appear when the coupling of the grains to the intermediate "bridge" is weak enough. Obtained results are in agreement with the experiments. [1]. Y. Zhou, M. Freitag, J. Hone, C. Staii, A.T. Johnson, N.J. Pinto and A.G. MacDiarmid, Appl.Phys.Lett., v.83, 3800 (2003). [2]. V.N. Prigodin and A.J. Epstein, Physica B, v.338, 310 (2003). [3]. S. Datta, Nanotechnology, v.15, S433 (2004).

Natalya A. Zimbovskaya
University of Puerto Rico at Humacao (UPRH)

Date submitted: 23 Nov 2004 Electronic form version 1.4