Abstract Submitted
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Charge transport in conducting polymer nanofibers NATALYA ZIMBOVSKAYA, University of Puerto Rico - Humacao — Here, we present theoretical analysis of electron transport in polyaniline based (PANi) nanofibers assuming the metalic state of the material. To build up this theory we treat conducting polymers as a special kind of granular metals, and we apply the quantum theory of conduction in mesoscopic systems to describe the transport between metallic-like granules. Our results show that the concept of resonance electron tunneling as the predominating mechanism providing charge transport between the grains is supported with recent experiments on the electrical characterization of single PANi nanofibers. By contacting the proposed theory with the experimental data we estimate some important parameters characterizing the electron transport in these materials [1]. Using the Buttiker dephasing model within the scattering matrix formalism we analyze dephasing effects, and we show that these effects could be reduced enough to allow the structure of the electron transmission function to be exposed in the experiments on the electronic transport through fibers [2]. Also, we discuss the origin of rectifying features observed in current-voltage characteristics of fibers with varying cross-sectional areas. 1. N. A. Zimbovskaya, A. T. Johnson, Jr., and N. J. Pinto, Phys. Rev. B 72, 024213 (2005). 2. N. A. Zimbovskaya, J. Chem. Phys. 123, 114708 (2005).

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