

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Exponential behavior of the Ohmic transport in organic films

CORNELIU COLESNIUC, Department of Physics and Center for Advanced Nanotechnology, University of California San Diego, La Jolla, California 92093 , RUDRO BISWAS, Department of Physics, Harvard University, Cambridge, Massachusetts 02138, SAMUEL HEVIA, Facultad de Física, Universidad Católica de Chile, Casilla 306, Santiago, Chile 6904411, ALEXANDER BALATSKY, Theoretical Division and Center for Integrated Nano-Technologies, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, IVAN SCHULLER, Department of Physics and Center for Advanced Nanotechnology, University of California San Diego, La Jolla, California 92093 — An exponential dependence of conductance on thickness and temperature was found in the low voltage, Ohmic regime of copper (CuPc) and cobalt (CoPc) phthalocyanine, sandwiched between palladium and gold electrodes, unlike ever claimed in organic materials. A comparison with conventional models fails to explain all the data with a single set of parameters. On the other hand, a model which incorporates tunneling between localized states with thermally-induced overlap agrees with the data, and decouples the contributions to conductance from the electrode-film interface and the bulk of the film. Work supported by AFOSR, DOE and the UCOP program on carbon nanostructures.

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Date submitted: 02 Dec 2010

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