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Nanotubes in polar solvents: Solvation and physical properties of excess charge carriers GEOFFREY USSERY, YURI GARTSTEIN, Dept. of Physics, University of Texas at Dallas — An excess charge carrier added to a one-dimensional (1D) semiconductor immersed in a polar solvent can undergo self-localization into a large-radius adiabatic polaron whose physical properties differ significantly from band states. Using a simplified theoretical model for small-diameter tubular structures immersed in a 3D polarizable solvent, we explore some testable signatures of these solvation-induced polarons. We discuss optical (infrared) absorption due to transitions between localized electronic states formed in the self-consistent polarization potential well, local dielectric relaxation modes around the polaron, and its mobility. Numerical estimates indicate that the dissipative drag of the polar environment can reduce the mobility by orders of magnitude in comparison with intrinsic values. Thermal fluctuations of the medium also cause a substantial broadening of the local optical absorption from the polaron. For more detail, see Yu. N. Gartstein and G. L. Ussery, Phys. Lett. A, 372, 5909 (2008) and G. L. Ussery and Yu. N. Gartstein, J. Chem. Phys., 130, 014701 (2009).

Geoffrey Ussery
Dept. of Physics, University of Texas at Dallas

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