Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Analysis of Electric Field Alignment of PbSe Nanowires for Transport Studies C.D. CRESS, E.E. FOOS, J.E. BOERCKER, T.J. ZEGA, R.M. STROUD, J.G. TISCHLER, AL L. EFROS, S.C. ERWIN, Naval Research Laboratory — Colloidal PbSe nanowires have excellent electronic and thermoelectric properties including a direct band gap, small effective mass, high carrier mobilities, large static dielectric constant, and a high thermoelectric figure of merit. Such properties make them attractive for a wide array of applications including transistors, detectors/solar cells and thermoelectrics, among others. Recently, the ability to selectively deposit and align PbSe nanowires between patterned metal electrodes using a static electric field has been demonstrated. This is a critical step towards functional integration of these materials into devices; however, larger scale assemblies and deposition of PbSe onto substrates free of metal contact are still needed. In this presentation, the use of dc and ac electric fields to pattern large arrays of aligned PbSe nanowires is demonstrated. The effects of electrode separation, field intensity, and solvent type are discussed. This technique is then extended to patterning of PbSe nanowires onto dielectric materials using the fringing fields of buried contacts to induce the alignment. Simulations have been developed to calculate and illustrate the fields induced within the solvent for the various biasing conditions, geometries, and solvents used. This talk will conclude with a discussion of the transport properties of the aligned PbSe devices.

C.D. Cress
Naval Research Laboratory

Date submitted: 30 Dec 2009 Electronic form version 1.4