Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Doping semiconductor nanocrystals: Experiment DAVID NORRIS, LIJUN ZU, University of Minnesota, THOMAS KENNEDY, STEVEN ERWIN, MICHAEL HAFTEL, ALEXANDER EFROS, Naval Research Laboratory — The intentional introduction of impurities into semiconductor nanocrystals is a poorly understood process whose phenomenology remains largely unexplained. The preceeding talk outlines a theoretical model that addresses this doping problem. Here we experimentally test some of the predictions of this model. In particular, we use photoluminescence (PL), electron paramagnetic resonance (EPR), and inductively coupled plasma atomic emission spectroscopy (ICP-AES) to examine how the doping efficiency in ZnSe:Mn nanocrystals is influenced by various experimental parameters. In agreement with the theoretical model, the doping concentration can be enhanced by increasing the anion (Se) to cation (Zn) ratio in the growth solution. Finally, we exploit the predictions of the model to incorporate individual Mn impurities into previously undopable CdSe nanocrystals. This success indicates that doping is not intrinsically problematic in nanocrystals and a variety of doped particles should be experimentally realizable.

David Norris
University of Minnesota

Date submitted: 26 Nov 2004 Electronic form version 1.4