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X-ray Analysis of Erbium Doping in Group IV Nanocrystalline Materials ROBERT MEULENBERG, TONY VAN BUUREN, TREVOR WILLEY, JONATHAN LEE, LOUIS TERMINELLO, Lawrence Livermore National Laboratory — We have produced erbium-doped germanium nanoparticles using a new two cell physical vapor deposition system. Doped nanoparticles are fabricated using two methods: 1) by co-evaporation of Er and Ge and 2) by Er deposition on the surface of undoped Ge nanoparticles. Using elemental specific x-ray techniques [x-ray absorption (XAS) and photoemission (PES) spectroscopy], we are able to monitor band edge shifts as a function of both particle size and Er concentration. In addition, we have used XAS and PES to probe the chemical environment of Er in Ge nanoparticles. We find that large Er/Ge ratios lead to strong spectroscopic signatures in the core level PES spectra. Lower Er/Ge ratios show very little effects in the core level spectra; however, the valence band density of states is altered which allows PES to probe dilute concentrations of Er in Ge nanoparticles. Impact of Er doping on the Ge nanoparticle electronic structure will be discussed. This work was supported by the Division of Materials Sciences, Office of Basic Energy Science, and performed under the auspices of the U. S. DOE by LLNL under contract No. W-7405-ENG-48.

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