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Impact of particle interactions on the photoluminescent stability of silicon nanocrystal clusters JOSEPH B. MILLER, Rice University, NAVEEN DANDU, NDSU, REBECCA J. ANTHONY, UWE R. KORTSHAGEN, UMN, DANIEL M. KROLL, SVETLANA KILINA, ERIK K. HOBBIE, NDSU — We combine experiments, Monte Carlo simulations and ab initio calculations to explore the influence of inter-particle interactions on the photoluminescent stability of silicon nanocrystal (SiNC) clusters. The time-dependent photoluminescence (PL) emitted by structures ranging in size from a single nanocrystal to collections of several thousand SiNCs is compared with Monte Carlo simulations of non-interacting nanocrystal ensembles. The discrepancy is modeled using calculations of the energy transfer rate between neighboring SiNCs as a function nanocrystal size, separation, and size disparity, and the influence of surface defects and excitation power on PL stability is explained.

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