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Many-particle effects in the photoluminescent response of silicon quantum-dot solids JOSEPH B. MILLER, AUSTIN R. VAN SICKLE, North Dakota State University, REBECCA R. ANTHONY, UWE R. KORTHSHAGEN, University of Minnesota, DANIEL M. KROLL, ERIK K. HOBBIE, North Dakota State University — Monodisperse colloidal suspensions of ligand-coated silicon nanocrystals (SiNCs), synthesized through a nonthermal low-pressure plasma reaction, are prepared through density-gradient ultracentrifugation in mixed organic solvents. The SiNC fractions are then self-assembled into close-packed quantum-dot "solids" and clusters, and photoluminescent properties of the resulting ordered ensembles are characterized through optical spectroscopy. We find striking manifestations of particle-particle interactions in the measured optical response, and we model these effects using Monte Carlo simulations of the photobleaching kinetics in dense SiNC packings.

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