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Evolution of CdSe/ZnS Quantum Dot Ensembles Under Prolonged Excitation[1] GEORGIY SHCHERBATYUK, RICHARD INMAN, SAYANTANI GHOSH, University of California, Merced — We study the spectral evolution of self-assembled ensembles of CdSe/ZnS core/shell quantum dots (QDs) under photo-excitation in ambient conditions. We use spatially-resolved photoluminescence (PL) scanning microscopy in conjunction with spectrally-resolved time-resolved spectroscopy to measure variations in spectral intensity, emission wavelength and recombination lifetimes. Our results indicate that the spectral intensity of the ensemble undergoes both photo-induced brightening and darkening, and these rates have a complicated dependence on the concentration of the QD samples. They initially decrease with decreasing concentration but are greatly enhanced in the dilute limit. The photo-exposure also causes a rapid spectral red-shift followed by a slow blue-shift. The recombination lifetimes increase with the red-shift for all concentrations but do not correlate to the blue-shift in a straightforward manner in different samples. We conclude the possible explanation of this behavior is the interplay of photo-induced surface trap discharging and preferential photo-oxidation of the smaller QDs in the ensemble.

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