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Delayed Charge Transfer between CdSe Quantum Dots and Organic Radicals through Trapping-Restore-Transfer Route[1] CHENJIA MI, Michigan State Univ, REMI BEAULAC[2], Department of Chemistry, Michigan State University, 574 South Shaw Lane, East Lansing MI, 48824 — Semiconductor nanocrystals, or quantum dots (QDs), are fascinating materials that have high extinction coefficients, high luminescence quantum yields, and tunable electronic properties. Charge transfer processes involving QDs is a particularly interesting area of research both fundamentally and for real life applications. Here, we combined CdSe QDs with Carboxyl-phenyl nitronyl nitroxide (CPNN) radicals to study electron transfer processes. CPNN has a significant quenching effect up the photoluminescence of QDs. From the quenching study, we found that QD-CPNN system has a delayed transfer behavior: excitons recombining faster are quenched more efficiently and vice versa. We modeled this phenomenon with a trapping-restore model, in which the exciton is stored in surface traps of QDs, and the recombination and transfer happens after the exciton was re-populated into the excited state by thermal energy. At higher concentration of CPNN, a saturation behavior of quenching was shown. We applied Langmuir Isotherm to the Stern-Volmer relationship to fit the entire quenching data. A quenching rate constant was extracted from both models and showed a good agreement on each other.

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