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In-Situ Studies of Photoluminescence Quenching in Single Crystal Quantum Dot Sensitized Solar Cells DOUGLAS SHEPHERD, Department of Physics, Colorado State University, YONG-QI LIANG, School of Energy Resources, University of Wyoming, JUSTIN SAMBUR, Department of Chemistry, Colorado State University, BRUCE PARKINSON, School of Energy Resources, University of Wyoming, MARTIN GELFAND, Department of Physics, Colorado State University, ALAN VAN ORDEN, Department of Chemistry, Colorado State University — Single crystal quantum dot sensitized solar cells (QDSSC) are a promising photovoltaic system in which collection of multiple charge carriers per photon has recently been reported.[1] Utilizing time-correlated single photon counting we have studied both the fluorescence intensity and fluorescence decay time from CdSe quantum dots coupled to both single crystal TiO_2 and ZnO substrates through short and long chain ligands. We find that for all configurations the fluorescence decay time is quenched compared to unbound quantum dots in solution, while the photovoltaic properties of the system strongly depend on the chain-length of the ligand. These results suggest there exist interactions between either the individual quantum dots or the quantum dots and substrate that may compete with the charge injection process in QDSSCs.

[1]Justin B. Sambur, Thomas Novet, B.A. Parkinson, *Science* **330** (6000) 63-66

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