Abstract Submitted
for the MAS16 Meeting of
The American Physical Society

Electron transfer from single quantum dot to individual acceptor molecules[1] HAIXU LENG, JAMES LOY, Univ of Maryland-Balt County, VICTOR AMIN, EMILY WEISS, Department of Chemistry, Northwestern University, MATTHEW PELTON, Univ of Maryland-Balt County; Center for Nanoscale Materials, Argonne National Laboratory — The charge transfer rate from a single quantum dot to viologen molecules is studied by time-resolved photoluminescence measurements at the single-nanocrystal level. These hybrid structures are model systems for the understanding of the potential to serve as the basis of next-generation photovoltaic and photocatalytic devices. Previous ensemble measurements on quantum-dot / molecule complexes have been unable to directly resolve the charge-transfer rate from a quantum dot to a single molecule, because of the random distribution of the number of adsorbed molecules on each dot. By making measurements at the single-particle level, we are able to push the sensitivity of charge-transfer measurements down to the level of single acceptor molecules. For each QD measured, the electron-transfer rate is constant over time, and the photoluminescence blinking dynamics are independent of the measured transfer rate. The total electron-transfer rate is distributed in discrete, constant increments, corresponding to discrete numbers of adsorbed molecules on each QD. The measurement provides an optical method to count the number of active acceptor molecules bound to a single nanocrystal.

[1]Supported by Institute for Sustainability and Energy at Northwestern and by the National Institute of Standards and Technology.

Haixu Leng
Univ of Maryland-Balt County

Date submitted: 13 Sep 2016 Electronic form version 1.4