Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Charged-biexciton emission from single semiconductor CdSe nanocrystals FENGRUI HU, XIAOYONG WANG, MIN XIAO, Nanjing University — Biexciton of a single semiconductor nanocrystal (NC) describes an intriguing electronic configuration with two electron-hole pairs present simultaneously within its excitation volume. Due to enhanced Coulomb interaction between charge carriers, biexcitons in NCs are mainly dissipated in a nonradiative Auger process on the subnanosecond timescale, which sets a stringent time limit within which one can characterize their optical properties. Here we performed time-tagged time-resolved measurements on single CdSe NCs under both low- and high-power excitation regimes. Under low-power excitation regime, optical emissions from both negatively- and positively-charged single excitons could be clearly resolved, together with that from neutral single excitons. The origin of positively-charged single excitons can be attributed to the electron tapping effect, while that of negatively-charged single excitons to the Auger ionization process. With the high-power excitation scheme, both negatively- and positively-charged biexcitons were additionally formed, as confirmed from the second-order photon correlation measurements. The successful preparation of charged biexcitons marks a crucial step towards the realization of efficient cascaded or entangled photon pairs from a single semiconductor NC.

Fengrui Hu
Nanjing University

Date submitted: 12 Nov 2013 Electronic form version 1.4