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Lifetime Blinking in Non Blinking Quantum Dots[1] VICTOR KLIMOV, YAGNASENI GHOSH, ANDREA STEINBRUECK, JENNIFER HOLLINGSWORTH, HAN HTOON, CHRISTOPHE GALLAND, Los Alamos National Laboratory — Photoluminescence (PL) blinking is a common property of nanoscale light emitters. Nanocrystal quantum dots have often been used as model systems in studies of this intriguing phenomenon. Here, we use recently developed thick-shell CdSe/CdS NQDs to demonstrate a new regime of blinking where discrete fluctuations in the PL lifetime ("lifetime blinking") occur without appreciable changes in the PL intensity. Single-dot measurements under controlled electrochemical charge injection [1] yield the PL lifetimes of neutral and charged excitons. We show that the observed "lifetime blinking" are due to random charging/discharging of the nanocrystal [2]. Indeed, the injection of electrons does not appreciably modify the PL quantum yield, which explains the coexistence of a nonblinking intensity with a "blinking" lifetime. At higher excitation power, charged excitons dominate the PL emission. We build a quantitative model showing that nanocrystal charging is caused by Auger-assisted ejection of a hole, producing negatively charged species. Importantly, Auger recombination that involves excitation of an electron is suppressed while hole-based processes remain efficient.

[1] Galland *et al.*, Nature **479**, 203-207 (2011)
[2] Galland *et al.*, Submitted (2011)

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