

# MULTI - EXCITON GENERATION BY A SINGLE PHOTON IN NANOCRYSTALS

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Very efficient multi-exciton generation has been recently observed in nanocrystals where an optically excited electron-hole pair with an energy greater than the effective bandgap produces one or more additional electron-hole pairs [1,2]. We present a theory of multiple exciton generation in nanocrystals [3]. We have shown that very efficient and fast exciton generation in nanocrystals is caused by the breaking the single electron approximation for carriers with kinetic energy above the effective energy gap. The concept allows us to define the condition for dominant two-exciton generation by a single photon: the thermalization rate of a single exciton, initiated by light, should be lower than the both the two exciton thermalization rate and the rate of Coulomb coupling between single and two exciton states. We have also explained why the threshold of highly efficient multiple exciton generation in PbSe nanocrystals begins at photon energy close to the 3 times of the effective energy gap of the nanocrystals. The recent carrier-multiplication controversy will be discussed.

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2. R. J. Ellingson, M. C. Beard, P. Yu, O. I. Micic, A. J. Nozik, A. Shabaev, and Al. L. Efros, NanoLetter **5**, 865 (2005).
3. A. Shabaev, Al. L. Efros, and A. J. Nozik, NanoLetter **6**, 2856 (2006).