Abstract Submitted
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Atomistic calculations of the exciton-biexciton mixing and biexciton lifetime in CdSe nanocrystals[1] MAREK KORKUSINSKI, OLEKSANDR VOZNYY, PAWEL HAWRYLAK, Institute for Microstructural Sciences, NRC Ottawa, Canada K1A 0R6 — We present an atomistic tight-binding theory of multiexciton complexes in spherical CdSe nanocrystals. As shown previously [1] the properties of exciton (X) and biexciton (XX) are determined by the shell of four quasi-degenerate states at the top of the valence band, resulting in a band of correlated XX states. This XX fine structure affects the Coulomb mixing of the low-lying XX with excited X states. Here we compare different approaches to computation of the XX ground state lifetime. The Fermi's golden rule accounting only for directly coupled XX and X configurations is compared to configuration-interaction approach where XX and X with energy close to 2Eg are taken into account. We show that the expansion of the basis of single particle configurations used to describe XX leads to a significant increase of the amount of X configurations to which XX can couple. The effect of inclusion of the X configurations coupled to XX indirectly via the intermediate X states is also discussed.

[1] M. Korkusinski, O. Voznyy, and P. Hawrylak, arXiv:1010.0021 (Phys. Rev. B, 82, 2010, in press).

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