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Exciton radiative lifetime and the "dead-layer" effect in ZnO quantum dots VLADIMIR A. FONOBEROV, ALEXANDER A. BALANDIN, Nano-Device Laboratory (http://ndl.ee.ucr.edu/), Department of Electrical Engineering, University of California, Riverside, CA 92521 — ZnO quantum dots (QDs) have recently attracted significant attention due to the proposed optoelectronic and nanoelectronic applications. We theoretically investigated the exciton radiative lifetime and the thickness of the "dead-layer" (layer where exciton does not penetrate) for ZnO QDs with radii from 1 to 3 nm [1]. Our calculations show that the dead layer formed near the QD surface is rather thick for ZnO QDs, what is attributed to the large hole-electron effective mass ratio in ZnO. The excited exciton states are also investigated as a function of the ZnO QD size. The small radiative lifetime and thick dead layer found in ZnO QDs can be beneficial for device applications owing to better luminescence and isolation of the exciton from surface defects [2]. The obtained results can be used for the optimization of ZnO QD arrays for optoelectronic applications. The authors acknowledge the support of MARCO and its Functional Engineered Nano Architectonics (FENA) Focus Center. [1] V.A. Fonoberov and A.A. Balandin, Phys. Rev. B 70, 195410 (2004). [2] V.A. Fonoberov and A.A. Balandin, Appl. Phys. Lett. 85, in press (Dec. 20, 2004).

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