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On the nature of ultraviolet photoluminescence in ZnO quantum dots VLADIMIR A. FONOVEROV, 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 for applications in ultraviolet (UV) light-emitting diodes, lasers, varistors, as well as QD-based nano-electronic components. However, the nature of the UV photoluminescence (PL) from ZnO QDs has not been fully understood [1]. We address this issue by examining theoretically the optical properties of technologically important 2-6 nm in diameter ZnO QDs [2] with and without ionized impurities at the surface. It is found that depending on the surface passivation technique, the UV PL in ZnO QDs can be attributed to either confined excitons or surface-bound ionized acceptor-exciton complexes. In the latter case the Stokes shift of the order of 100-200 meV is observed in PL spectrum. We also find that the exciton radiative lifetime can be used as a probe of the exciton localization. The authors acknowledge the support of MARCO and its Functional Engineered Nano Architectonics (FENA) Focus Center. [1] V.A. Fonoberov and A.A. Balandin, Appl. Phys. Lett. 85, in press (Dec. 20, 2004). [2] V.A. Fonoberov and A.A. Balandin, Phys. Rev. B 70, 195410 (2004).

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