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Carrier Dynamics and Photoexcited Emission Efficiency of ZnO:Zn Phosphor Powders JOHN V. FOREMAN, HENRY O. EVERITT, Dept. of Physics, Duke University, Durham, NC 27708 and U.S. Army Aviation and Missile RDEC, Redstone Arsenal, AL 35898, JIE LIU, Dept. of Chemistry, Duke University, Durham, NC 27708 — Nonstoichiometric ZnO with an excess of Zn atoms (ZnO:Zn) has a long history of use as a green/monochrome phosphor in electron-excited vacuum fluorescent and field emission displays. We previously studied the external quantum efficiency of such ZnO:Zn powders under continuous-wave photoexcitation and found that the efficiency depended sensitively on excitation density [*Appl. Phys. Lett.* **91**, 011902 (2007)]. Here we study experimentally the time-integrated quantum efficiency and the time-resolved photoluminescence decays of both band edge and defect emission of ZnO:Zn powders under femtosecond pulsed excitation of varying intensity. The results are discussed in terms of a rate equation model which describes energy transfer between band edge and radiative defect levels, as well as nonradiative centers.

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