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Carrier Dynamics and Emission Efficiency in Sulfur-doped ZnO Powders JOHN V. FOREMAN, HENRY O. EVERITT, Dept. of Physics, Duke University, Durham, NC 27708 and U.S. Army Aviation & Missile RDEC, Redstone Arsenal, AL 35898, JIE LIU, Dept. of Chemistry, Duke University, Durham, NC 27708 — In previous work [*Nano Lett.* **6**, 1126 (2006)] it was found that sulfur-doping ZnO micro- and nanostructures dramatically enhanced the broadband, visible wavelength defect emission centered at ∼2.5 eV (500 nm), while quenching the band edge ultraviolet emission. The effects of sulfur-doping on carrier dynamics and integrated emission efficiency are further characterized here by studying the time-resolved photoluminescence of band edge and defect emitters as a function of sulfur doping concentration, temperature, and excitation intensity in ZnO powders. The dynamics can be understood in terms of a rate equation model which describes energy transfer between band edge and radiative defect levels, as well as nonradiative centers. The potential application of these materials for efficient visible wavelength phosphors will be discussed.

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