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Exceptionally Bright Visible-wavelength Luminescence from Sulfur-doped ZnO Nanowires JOHN V. FOREMAN, U.S. Army Aviation and Missile RDEC, Redstone Arsenal, Alabama 35898 and Department of Physics, Duke University, Durham, North Carolina 27708, HONGYING PENG, Department of Physics, Duke University, JIANYE LI, Department of Chemistry, Duke University, SOOJEONG CHOI, Department of Physics, Duke University, HENRY O. EVERITT, U.S. Army Aviation and Missile RDEC and Department of Physics, Duke University, JIE LIU, Department of Chemistry, Duke University — Sulfur-doped ZnO nanowires have been grown by the vapor-liquid-solid technique using ZnS and carbon as starting materials. The broadband, visible-wavelength emission of unprecedented brightness from these nanowires is characterized by steady-state and time-resolved spectroscopy. Energy transfer is explored by simultaneously studying the fast (<50 ps) decay of band edge emission and the slow (>5 ns) decay of the visible-wavelength emission as a function of temperature and excitation intensity. The contributions of sulfur doping and nanostructuring to the generation of this intense visible-wavelength emission are clarified by characterizing ZnO nanowires and micropowders of different morphologies and dopant concentrations. The results can be understood in terms of a physically motivated rate equation model, for which several of the key parameters are experimentally constrained.

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