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Competition of Nonlinear Optical Properties in ZnO Nanoparticles JIE LIN, ANTONIO LLOPIS, BENNY URBAN, University of North Texas, YASUHISA FUJITA, Shimane University, ARUP NEOGI, University of North Texas — ZnO nanoparticles have attracted increased attention due to its large exciton binding energy. Moreover it has enhanced nonlinear optical properties due to its noncentrosymmetric crystal structure which results in a second order nonlinearity. The presence of oxygen vacancy and modified surface states also yields third order nonlinearity such as two photon absorption which yield significant two-photon emission. However, the presence of high second order nonlinearity in a system can result in the retardation of the third order nonlinearity. We thereby present the relative efficiencies of the second and the third-order nonlinear processes in ZnO nanoparticle system. Using tunable femtosecond laser irradiation the recombination lifetime due to single and two-photon induced electron-hole recombination process has been studied. Our results show that the second harmonic generation (SHG) process compete with the two photon emission(TPE) process in the region 700nm—900nm. The TPE process is more efficient in 700 nm-740nm whereas the SHG process is more efficient from 745-900nm) region. We also observed the increase of the two photon emission with excited energy is caused by the increased life of its virtual state.

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