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Photon/Exciton-Polariton scattering cross section in cuprous oxide

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We have previously found that third harmonic generation contributes to three photon absorption in cuprous oxide (Cu_2O), particularly during two photon pumping of orthoexciton-polaritons. In the experiments to be described here we used an optical probe field to demonstrate exciton-polariton photoionization through resonant, two frequency, three photon absorption. In our experiments, a flux of 1s orthoexciton-polaritons was prepared by two photon absorption. In addition, a collinear, below-the-bandgap probe pulse was applied at variable times relative to the first pulse. The decrease in the transmitted exciton-polariton luminescence was used to determine the photon/exciton-polariton scattering cross section. The temporal evolution of the exciton-polariton density was determined by measuring the luminescence decrease due to photoionization as a function of the pump/probe temporal separation. Selection rule tests verified the symmetry of the scattering process. Photoionization yielded additional luminescence through recombination of the carriers generated by the ionization. This distinctive multiphoton absorption process demonstrates the feasibility of an optoexcitonic switch. Exciton photoionization may lead to a photovoltaic effect for photon energies below the bandgap.

Biography

Laszlo Frazer is a PhD Candidate in physics at Northwestern University. He has a MS and a graduate teaching certificate from Northwestern and a BA from the University of Chicago. His research focuses on excitonics in cuprous oxide and nonlinear optics.