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Electron transfer and relaxation dynamics in heterovalent ZnSe/GaAs quantum well structures AMIT DONGOL, HANS PETER WAGNER, Department of Physics, University of Cincinnati, OH-45221, USA — We investigate the electron transfer and relaxation dynamics in heterovalent ZnMgSe/ZnSe quantum wells (QW's) grown on GaAs using the nonlinear optical method of three-beam degenerate four-wave-mixing (FWM). We use ultra-short (90 fs) laser pulses with non-collinear wave-vectors $\mathbf{k}_1$, $\mathbf{k}_2$ and $\mathbf{k}_3$ at a center wavelength of 441 nm ($\sim$2.81 eV) which is resonantly tuned to the heavy hole exciton transition energy at 25 K. In the experiment the time coincident strong pump pulses $\mathbf{k}_1$ and $\mathbf{k}_2$ creates both an exciton density grating in the QW and an electron-hole pair grating in the GaAs while the delayed weak pulse $\mathbf{k}_3$ simultaneously probes the exciton lifetime T_1 as well as the electron grating injection time T_t from the substrate into the QW. Intensity dependent experiments reveal that the diffraction efficiency due to the electron grating increases faster with increasing $\mathbf{k}_1$ and $\mathbf{k}_2$ pulse intensities than the FWM efficiency due to the generated exciton density grating. This behavior which is attributed to exciton bleaching at high intensities enables the discrimination of times T_1 and T_t, both being in the order of a few tens of picoseconds.

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