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Carrier dynamics in colloidal indium arsenide quantum dots in the weak excitation limit AUSTIN SPENCER, Univ of Colorado - Boulder, WILLIAM PETERS, Univ of Colorado - Boulder, JILA, VIVEK TIWARI, BYUNG-MOON CHO, Univ of Colorado - Boulder, NATHAN NEALE, National Renewable Energy Laboratory, DAVID JONAS, Univ of Colorado - Boulder — The dynamics of photo-excited carriers in colloidal indium arsenide (InAs) quantum dots are characterized by degenerate pump–probe spectroscopy at 1.5 times the band gap. This material is of particular interest due to reports of efficient multiple exciton generation and its potential application in third-generation photovoltaic devices. Use of a sample renewal technique based on laser beam scanning enables long resampling times (>0.5 s) with minimal spatial overlap between successive laser shots thereby minimizing repetitive excitation. Pump–probe transients at a range of excitation probabilities are reported, from 2.6%, where signal from biexcitons is small (1.9%), to 36%, where the biexcitons contribute 45% of the signal. These transients are well described by a tri-exponential fit which includes time constants of approximately 1 ps, 16 ps, and 750 ps tentatively attributed to carrier cooling, multi-exciton recombination, and single exciton recombination respectively. By an excitation probability of 10%, biexciton dynamics are detectable and continue to grow in magnitude as the excitation probability increases. The pump power dependence of the signal at 20 ps, which deviates from linearity at an excitation probability of 10%, reflects biexciton recombination.

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