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Relaxation dynamics of excitons in a bimodal distribution of CdSe/ZnSSe quantum dots PRADEEP BAJRACHARYA, HANS PETER WAGNER, TUAN NGUYEN, SEBASTIAN MACKOWSKI, LEIGH M. SMITH, University of Cincinnati Cincinnati 45221, U.W. POHL , DIETER BIMBERG , Institut für Festkörperphysik TU Berlin 10623, Germany, MARTIN STRASSBURG, Georgia State University Atlanta — We have studied the dynamical behavior of excitons in a bimodal distribution of CdSe/ZnSSe quantum dots by intensity dependent, temperature dependent and time resolved PL. The effect of exciton localization is investigated and described, both theoretically and experimentally by identifying transfer mechanisms due to thermalization and redistribution of excitons. We observe a dominant exciton emission from smaller dots (QDs1) and weaker emission from wider dots (QDs2) at 10 K and at low optical excitation. At high excitation densities a CdSe precursor state becomes visible at the high energy side of the QDs1 emission. Temperature dependent PL studies reveal a thermally activated exciton transfer between the different types of QDs resulting in a dominant QDs2 emission above 60 K. Time resolved PL measurements allow to estimate the characteristic radiative and non-radiative decay rates as well as the transfer rate of excitons between different QDs. The experimentally observed PL is successfully reproduced by a coupled rate equation model.

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