Temperature dependent recombination dynamics in InP/ZnS colloidal nanocrystals

In this letter, we investigate exciton recombination in InP/ZnS core-shell colloidal nanocrystals over a wide temperature range. Over the entire range between room temperature and liquid helium temperature, multi-exponential exciton decay curves are observed and well explained by the presence of bright and dark exciton states, as well as defect states. Two different types of defect are present: one located at the core-shell interface and the other on the surface of the nanocrystal. Based on the temperature dependent contributions of all four states to the total photoluminescence signal, we estimate that the four states are distributed within a 20 meV energy band in nanocrystals that emit at 1.82 eV.