Abstract

Tuning the charge transfer rate between quantum dots (QDs) and metal oxide (MO) is important for improving the performances of QDs-MO devices. And tailoring the energy band of MO is one way to tune the charge transfer rate. In this work, we enhance the charge transfer rate between CdTe QDs and ZnO through tailoring the optical band gap of ZnO nanofilms by Ga-doping. The Ga doping influenced the photo luminescence (PL) performance of CdTe QDs/ZnO hybrid structures. The results of time-resolved fluorescence spectra revealed that the charge transfer rate from CdTe QDs to ZnO nanofilms could be tuned by varying the Ga doping concentrations in ZnO. And, transfer rate were increased by up to ~4.1 times through Ga doping. In addition, the structure showed electron transfer efficiency improvements to the tune of ~25.3%. We attribute the improvement to efficient electron transfer via band-band transfer and the defects pathways induced by Ga-doping. The experimental results will be useful for improving the efficiency of optical devices using QDs/ZnO hybrid structure.