MASTER'S THESIS

Energy transfer in hybrid system consisting of quantum dots/quantum wells and small luminescent molecules

Wu, Weiwei

Date of Award:
2009

Energy Transfer in Hybrid System Consisting of Quantum Dots/ Quantum Wells and Small Luminescent Molecules

WU Weiwei

A thesis submitted in partial fulfillment of the requirements

for the degree of

Master of Philosophy

Principal Supervisor: Prof. K. W. Cheah

Hong Kong Baptist University

September 2009

Abstract

The hybrid system consisting of low-dimensional semiconductors and organics is interesting both in fundamental and applied physics. The energy transfer is of great importance in the system. We have studied two kinds of hybrid system: one is CdSe/ZnS Quantum Dots (QDs) hybridizing with N-(4-methoxyphenyl)-N-phenylnaphthalen-1-amine (MeONPA), the other is GaN-based Quantum Wells (QWs) with (4'-methoxy)-9-phenylcarbazole (MeOKPA). In these systems, the distance between the transition dipoles of inorganic and organic components is in the effect range of Förster Resonance Energy Transfer. By measuring Photoluminescence (PL), PL Excitation (PLE), Decay Lifetime, Two-Photon-Induced Fluorescence (TPIF), Power-Dependent PL and Temperature-Dependent PL spectra of the hybrid systems, we have observed the phenomenon of energy transfer. The MeONPA/QDs system shows efficient energy transfer under two-photon excitation, but the luminescence of QDs is quenched under one-photon excitation. This property can be utilized in application of bio-detector. The QWs/MeOKPA system shows efficient energy transfer. This property can be utilized in a variety of light emitting devices.

Table of Contents