Temperature and power dependence of photoluminescence in PbS quantum dots nanoparticles

ABSTRACT

In this study, the synthesis and the effect of temperature and power excitation towards photoluminescence (PL) emission of colloidal PbS quantum dots (QDs) were reported. Water soluble PbS QDs capped with a mixture of 1-thioglycerol (TGL) and dithioglycerol (DTG) was synthesized via colloidal chemistry method at room temperature. The PL emission of PbS QDs was investigated under temperature range from 10 K to 300 K and we found that the PL emission blue-shifted when the temperature is increased. From high resolution transmission electron microscopy (HRTEM), the average size of PbS core QDs is determined to be 6 nm and the integrated PL intensity (IPL) versus excitation power density shows the recombination of electrons and holes occur efficiently at low and high temperature for the PbS QDs. Full width half maximum (FWHM) shows a gradual broadening with the increasing temperature due to the interaction of charge carriers with phonons.

Keyword : Near infrared; PbS; Photoluminescence; Quantum dots