

OPTICAL PROPERTIES OF InP SELF-ASSEMBLED QUANTUM DOTS STUDIED BY IMAGING AND SINGLE DOT SPECTROSCOPY

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Abstract

The temperature dependent optical properties of InP self-assembled quantum dots (QDs) were investigated by means of micro-spectroscopy. Successive thermal quenching with increasing temperature was clearly observed. A few QDs, however, showed anomalous temperature dependence with the photoluminescence (PL) intensity recovering when the temperature was raised beyond a certain value. This phenomenon is explained by competition between radiative and nonradiative processes. In this work, the mechanism of blinking behavior was also studied. Notably, the micro-PL spectra of a blinking QD were artificially reproduced by applying an electric field to a normal QD. We concluded that the blinking is due to the trapping and delocalization of carriers at localized states near the QD. These results indicate that the optical properties of the zero-dimensional system are strongly influenced by the local environment surrounding the QDs.