

Photoluminescence of polymer-incorporated ZnO nanocrystals

Friday, 17 November 2023 14:00 (15 minutes)

Incorporation of colloidal NCs in polymer matrices is a way to tailor NC properties and to protect NCs from degradation under the influence of ambient. Investigation of luminescent NCs in optically transparent polymers is important in view of perspective applications in photonics, while composites of NCs and conductive polymers can be promising for photovoltaics, electroluminescence, and photodetectors [1]. In our work, we investigated the effects of embedding the ex-situ synthesized colloidal ZnO NCs in different water-soluble polymers, such as polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), polyethylene glycol (PEG), gelatine, and PEDOT:PSS [2]. In addition to monitoring the spectral and intensity changes in the NC PL spectrum, caused by polymer, we propose possible recombination mechanisms of the NC PL and the ways of their interaction with and polymer. Gelatine caused unexpectedly quenching of both PL excitonic (EPL) and DPL. The common major effect of PVP, PEG, and PVA is suppression of defect-related PL band (DPL), although at low NC loading the effect of these polymers is more different from each other than at high loading. The effect of PEDOT:PSS is relatively weak, as for conductive polymer, although distinct indications of structural and electronic changes in the polymer are found in Raman and XPS spectra.

1. Anni, M. Polymer-II-VI Nanocrystals Blends: Basic Physics and Device Applications to Lasers and LEDs // *Nanomaterials*.-2019.-9.P. 1036.
2. V. Dzhagan, O. Stroyuk, O. Raievska, O. Isaieva, O. Kapush, O. Selyshchev, V. Yukhymchuk, M. Valakh, and Dietrich R. T. Zahn. Photoinduced Enhancement of Photoluminescence of Colloidal II-VI Nanocrystals in Polymer Matrices // *Nanomaterials*. -2020.-10. P.2565.

Topics

Session A. Physics of condensed matter and spectroscopy

Primary authors: ISAIEVA, Oksana (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.); Prof. DZHAGAN, Volodymyr (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.); SELYSHCHEV, Oleksandr (Semiconductor Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany.); TOMA, Maria (Babes-Bolyai University, Physics Faculty, M. Kogalniceanu 1, 400084, Cluj-Napoca, Romania.); GULE, Yevhen (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.); Prof. YUKHYMCHUK, Volodymyr (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.); HRESHCHUK, Oleksandr (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.); Prof. ZAHN, Dietrich RT (Semiconductor Physics, Chemnitz University of Technology, 09107 Chemnitz, Germany.)

Presenter: ISAIEVA, Oksana (V. Lashkaryov Institute of Semiconductors Physics, National Academy of Sciences of Ukraine, Kyiv, Ukraine.)

Session Classification: Spectroscopy techniques and applications