

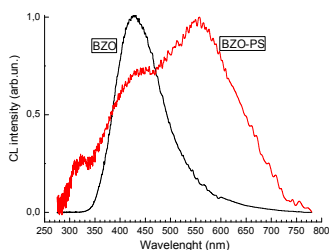
Nanocomposites and nanomaterials

Luminescent properties of BaZrO₃ nanocrystals embedded in the polymer matrices

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The synthesis of polymeric composites with inclusions of semiconductor nanoparticles is a new method of preparation the materials for electrooptical, sensor devices and solar cells using simple, safe and energy-efficient technology. The inorganic/organic nanosystems based on semiconductor nanocrystals and polymer matrices with conductive or thermoplastic properties are actively investigated. Interesting physical properties of perovskites, particularly, barium zirconate, promise the possibility to obtain new hybrid materials with useful functions. In the present work we studied the structure and luminescent properties of hybrid composites based on different polymer matrices and micro- ($d > 10 \mu\text{m}$) or nanocrystals of BaZrO₃ (BZO) ($< 50 \text{ nm}$) using SEM, X-ray analysis and cathodoluminescence (CL) spectroscopy (electron beam energy 10 keV). CL spectrum of BZO nanocrystals (see figure) represents strong peak at $\lambda = 430 \text{ nm}$. It has been found that entering the BZO nanocrystals in the polymer matrix of poly(phenyl acetylene), poly(vinyl alcohol), poly(3,4-ethylenedioxy thiophene) has not affect the characteristics of CL emission [1]. The position of luminescence maximum ($E = 2.83 \pm 0.02 \text{ eV}$) and the shape of the line do not undergo significant changes. In the case of polymer composites based on polystyrene (PS) containing from 1 to 20 % BZO this spectrum consists of the series of bands with different position of maxima. It is known that blue-green emission intensity of BZO under ultraviolet excitation depends on the degree of crystal lattice disorder. For BZO phase in composite a parameter of elementary cell (a) decreases from $4.19083(6) \text{ \AA}$ to $4.1879(2) \text{ \AA}$. Adsorption interactions between PS matrix and BZO grains surface confirmed by FTIR spectra.



1. *Aksimentyeva O., Savchyn V., Opaynykh I., Demchenko P., Horbenko Yu., Pankratov V., Popov A. I.* Effect of polymer matrix on the structure and luminescence properties of barium zirconate nanocrystals // Chem.Met. & Alloys. -2013.-6.-P. 72-76.