Influence of different polymers on photoluminescence of colloidal ZnO nanocrystals

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Motivation

ZnO nanoparticles are widely employed in the fundamental research and commercial applications.

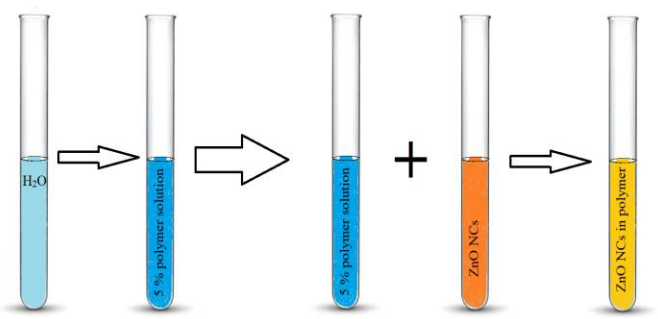
Embedding NCs in polymer

- to protect NCs from degradation
- to tailor NC properties

Goal

To investigate photoluminescence of NCs in transparent polymer matrices with different properties.

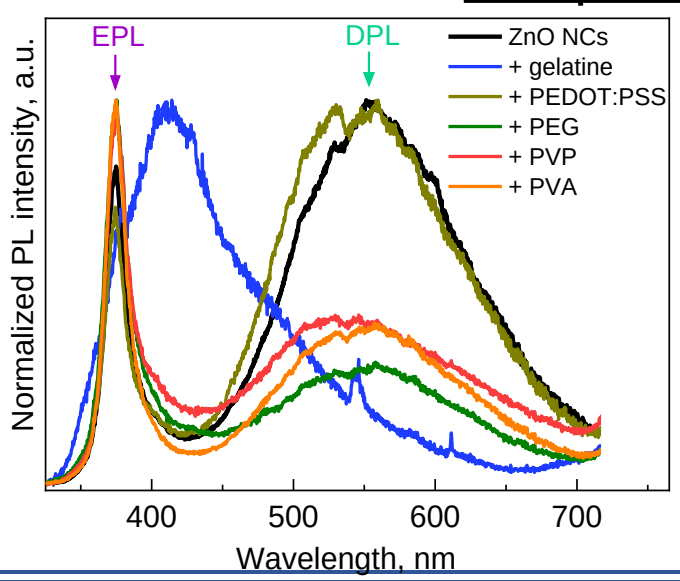
Ex-situ synthesis



Used polymers*:*

- Polyvinyl alcohol (PVA);
- Polyvinylpyrrolidone (PVP);
- Polyethylene glycol (PEG);
- Gelatine;
- Poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS).

PL spectra of nanocomposites



375 nm – excitonic/interband PL (EPL)
550 nm – defect-related PL (DPL) *(oxygen vacancies, oxygen interstitials, Zn vacancies, and Zn interstitials)*

Effect upon adding polymer:

- PEDOT:PSS - EPL/DPL intensity ratio not affected;
- PEG, PVP, PVA - EPL/DPL intensity ratio is increased;
- Gelatin - quenching EPL and DPL.

Conclusions

- Nanocomposites based on ZnO NCs and transparent polymers were prepared.
- It is established that adding of PVP, PEG, and PVA cases suppression of defect-related PL band.
- Incorporation of NCs into the PEDOT:PSS matrix does not change the ratio of EPL/DPL intensities.