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Spektrinių savybių pokyčiai indukuoti *trans*-stilbena agregatų susidarymu polistireno matricoje

Trans-stilbene spectral properties changes induced by aggregates formation in a polystyrene matrix

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1,2-diphenylethylene, so-called Stilbene, has two aromatic groups bonded to the carbon – carbon double bond. The main property of stilbene compounds is reversible *cis* – *trans* isomerization. During the isomerization two phenyl rings twist around single carbon – carbon bond. This property makes stilbene molecules potentially applicable to molecular switches [1]. Another perspective application of stilbene molecules is ionizing radiation detectors [2]. However, recently it was noticed that stilbenes exhibit unusual fluorescence dependence on temperature, which draws an attention to the aggregation impact on spectral properties [3]. For these reasons it is important to investigate the features of stilbene (*trans*-stilbene in particular) excitation dynamics. In this work *trans*-stilbene thin films (prepared via spin-coating technique in polystyrene (PS) matrix with different *trans*-stilbene mass ratios) are under investigation. To analyze changes (depending on temperature (from 15K to room temperature), mass of host and film thickness) in spectroscopical properties of *trans*-stilbene thin films stationary absorption, fluorescence and fluorescence decay were measured. Coherent anti-Stokes Raman spectroscopy (CARS) was performed to investigate the structure of thin films.

Absorption spectra shows the increased background intensity of higher concentrations films due to the light scattering induced by aggregates. The observed red shift from the fluorescence emission spectra confirms the aggregation processes observed with CARS. Moreover, the formation of molecular clusters results in fluorescence lifetimes variation. Nevertheless, the samples with higher concentrations experience the fluorescence enhancement due to the presence of aggregates of nano crystallites. The small nano crystallites subsequently form aggregates of 40-100 nm *trans*-stilbene nanocrystals.

Fluorescence quenching dynamics of different samples at different temperatures indicate aggregation-induced exciton diffusion in the solid forms of stilbene, which is precisely what is reflected in the fluorescence spectra. More details about the samples as well as their excitation dynamics features will be presented at the conference.

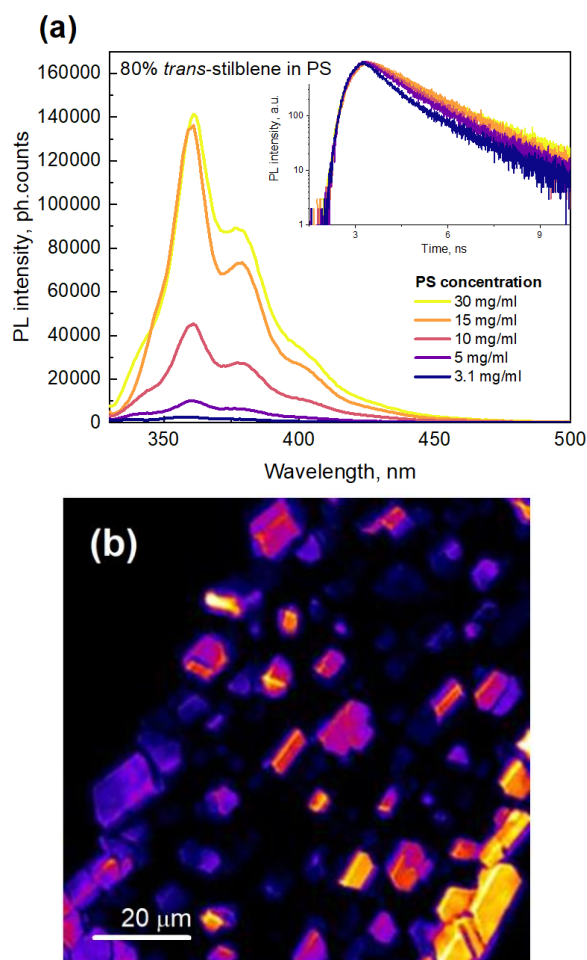


Fig. 1. (a) Fluorescence spectra and fluorescence kinetics ($\lambda_{\text{ex}} = 300 \text{ nm}$) of 80% *trans*-Stilbene in PS. (b) CARS image ($100 \mu\text{m} \times 100 \mu\text{m}$) of 80%-*trans*-Stilbene in 30 mg/ml PS.

Keywords: *trans-stilbene*; *nanoagregates*; *fluorescence*; *fluorescence decay*; *CARS*.

Literature

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