Trans-stilbene aggregates and crystallites in polystyrene films: microscopy and spectroscopy

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Stilbene is a typical molecule to demonstrate photoisomerization, playing a vital role in a variety of processes ranging from photochemistry to biology. *Trans-Cis* photoisomerization happens with liquid stilbene under UV irradiation, while its solid *trans*-isomer can remain stable. *Trans*-stilbene (TS) itself seems to be very promising material for, e.g., ionizing radiation detection [1]. *Trans*-stilbene could be prepared as a thin film in polystyrene (PS) matrix [2,3], and previous studies reveled unusual temperature dependence [2] as well as concentration effect [3] on spectral properties of such TS-containing thin polystyrene films.

In this work we provide a deep analysis of optical properties (absorbance, steady-state and time-resolved fluorescence as well as florescence excitation) of TS film, prepared in PS matrix, dependent on its structure (applying Atomic Force Microscopy and Coherent-Anti-Stokes Raman Scattering), varying both TS concentration and the film thickness. With the microscopy concentration/thickness-dependent formation of TS aggregates and crystallites is observed. One of the most inspiring results is that both concentration- and thickness-dependent fluorescence spectra and kinetics can be expressed as a linear combination of pure molecular and higher aggregates contributions. This means it is possible to control the properties of the prepared sample by adjusting film properties such as concertation and thickness. For instance, the solubility threshold of TS in the PS matrix can be found, above which aggregates start to form.

A more detailed discussion will be provided in the conference.

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