



Contribution ID: 262

Type: Oral Presentation

Diffusivity of single fluorescent probes embedded in thin polymer films

Thursday, 6 July 2017 15:00 (20 minutes)

Photophysics and photochemistry in polymer science has been of central areas of interest in understanding the structure and dynamics of polymers. The physical properties of polymers especially the dynamical properties close to the phase transition from rubbery to the glassy state are complex and have not been completely understood despite experimental and theoretical studies over the past decades [1]. Understanding the dynamics of polymer nano environments is highly crucial for numerous technological applications in various industrial and biomedical sectors related to protective and functional coatings and biocompatibility of medical implants [2]. The diffusivity of single probes embedded in thin polymer films can exhibit unusual physical properties due to geometric constraints imposed by the presence of surfaces and interfaces and using single molecule fluorescence microscopy as an imaging technique, allows one to look at the microscopic processes on the nanometer scale [3]. For this research single nanoparticles were embedded in thin polystyrene (PS) and poly (isobutyl methacrylate) (PIMA) films and were used to study the nano scale polymer dynamics via the diffusivity of the single nanoparticles. The diffusivity of the single nanoparticles was analyzed assuming a typical Brownian motion model that is used to calculate the mean square displacement of the single probes as a function of time, which in turn uniquely determines the diffusion coefficient of the single probes.

[1] R.A.Vallee et al. Single Molecule probing of glass transition phenomenon. *Chemical Physics* 2007,127, 15.

[2] B. Flier, et al. Heterogeneous Diffusion in Thin Polymer-Films as observed by High-Temperature Single Molecule Fluorescence Microscopy; *J. Am. Chem. Soc.*, 2012, 134, 480-488.

[3] N. Tomczak et al. Probing polymers with single fluorescent molecules. *European Polymer* 2004,40, 1001-1011.

Apply to be considered for a student award (Yes / No)?

yes

Level for award (Hons, MSc, PhD, N/A)?

Msc

Main supervisor (name and email) and his / her institution

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Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

No

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Session Classification: Photonics

Track Classification: Track C - Photonics