World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:12, No:03, 2018

Segmental Motion of Polymer Chain at Glass Transition Probed by Single Molecule Detection

Authors : Hiroyuki Aoki

Abstract : The glass transition phenomenon has been extensively studied for a long time. The glass transition of polymer materials is assigned to the transition of the dynamics of the chain backbone segment. However, the detailed mechanism of the transition behavior of the segmental motion is still unclear. In the current work, the single molecule detection technique was employed to reveal the trajectory of the molecular motion of the single polymer chain. The center segment of poly(butyl methacrylate) chain was labeled by a perylenediimide dye molecule and observed by a highly sensitive fluorescence microscope in a defocus condition. The translational and rotational diffusion of the center segment in a single polymer chain was analyzed near the glass transition temperature. The direct observation of the individual polymer chains revealed the intermittent behavior of the segmental motion, indicating the spatial inhomogeneity.

Keywords : glass transition, molecular motion, polymer materials, single molecule
Conference Title : ICCSE 2018 : International Conference on Chemical Science and Engineering
Conference Location : Prague, Czechia
Conference Dates : March 22-23, 2018

Open Science Index, Chemical and Materials Engineering Vol:12, No:03, 2018 publications.waset.org/abstracts/90107.pdf