

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Diffusion of single molecules on surface tethered polymer brushes

ZHENYU ZHANG, MATT MEARS, Department of Physics and Astronomy, University of Sheffield, Sheffield, S3 7RH, UK, MARK MOXEY, NICOLAS WARREN, JEPPE MADSEN, STEVEN ARMES, Department of Chemistry, University of Sheffield, Brook Hill, Sheffield, S3 7HF, UK, ANDREW LEWIS, Biocompatibles UK Ltd., Chapman House, Farnham Business Park, Weydon Lane, Farnham, Surrey, GU9 8QL, UK, MARK GEOGHEGAN, Department of Physics and Astronomy, University of Sheffield, Sheffield, S3 7RH, UK — The interaction between polymer molecules and brush surfaces in aqueous media is a multi-dimensional problem; the polymer competes with the solvent for surface sites, and the resultant molecular conformation controls its diffusion properties. The diffusion coefficients of single fluorescence-labeled poly(ethylene glycol) (PEG) molecules on surface-immobilized PEG brushes are measured by fluorescence correlation spectroscopy, and are shown to slow down by nearly 10 times when grafting density increased from 0.11 to 0.42 chain per nm^2 . This diffusion dynamics can be explained by Stokes-Einstein treatment of the surface-adsorbed polymer. Subsequently, we prepared a series of surface-grown poly(oligo(ethylene glycol) methacrylate) (POEGMA) brushes with varying grafting density. Diffusion coefficients of three types of fluorescence-labeled polymer (PEG, POEGMA, PGMA) on the POEGMA brushes were quantitatively measured. It was found that diffusion coefficient of PEG changed substantially over those POEGMA samples, with POEGMA to a small degree, and PGMA not affected. The data indicates that not only grafting density of polymer brushes, but also intermolecular interaction could affect the transport of macromolecules on polymer brushes.

Zhenyu Zhang
Department of Physics and Astronomy,
University of Sheffield, Sheffield, S3 7RH, UK

Date submitted: 25 Oct 2012

Electronic form version 1.4