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Diffusion of polyelectrolyte chains within layer-by-layer films: a combined FRAP and neutron reflectometry study VIKTAR SELIN, LI XU, Stevens Institute of Technology, Department of Chemistry, Chemical Biology and Biomedical Engineering, Hoboken, New Jersey 07030, JOHN F. ANKNER, Spallation Neutron Source, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA, SVETLANA A. SUKHISHVILI, Stevens Institute of Technology, Department of Chemistry, Chemical Biology and Biomedical Engineering, Hoboken, New Jersey 07030 — We report a comparative study of the diffusion of polyelectrolyte chains of various types and various molecular weights within polyelectrolyte layer-by-layer (LbL) films. To that end, we used a combination of fluorescence recovery after photobleaching (FRAP) and neutron reflectometry (NR) to probe chain diffusion in directions parallel and perpendicular to the substrate, respectively. LbL films were assembled using poly(methacrylic acid) (PMAA) as a polyanion and poly-2-(dimethylamino)ethyl methacrylate (PDMA) or quaternized PDMA (QPDMA) as a polycation. Fluorescently labeled and/or deuterated PMAA chains were incorporated within films as marker layers in FRAP and NR experiments, respectively. We found that in solutions of 0.2-0.6 M NaCl, chain diffusion was enhanced, with significantly faster chain motion in the direction parallel to the substrate. We will also discuss the effects of pH, salt concentration and polyelectrolyte type and molecular weight on mobility of polyelectrolyte chains within LbL films.

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