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Dynamics of nanoparticles in an entangled polymer matrix[1]
SUBAS DHAKAL, RADHAKRISHNA SURESHKUMAR, Department of Biomedical and Chemical Engineering, Syracuse University, Syracuse, NY 13244 — Quantitative description of the dynamics and rheology of the extracellular polymeric substance (EPS) of bacterial biofilms is still a major challenge due to their structural complexity. Recent experiments suggest that the viscoelasticity of EPS is not governed by entanglements in the polymer matrix. Here, we investigate the microstructure, dynamics and rheology of a Dextran EPS by probing the motion of nanoparticles embedded in the matrix using coarse-grained molecular dynamics simulations. Specifically, these simulations show that for particle diameter D >entanglement length l_e, the probe particles exhibit normal diffusion, while for D <l_e sub-diffusive motion modulated by the polymer chain dynamics is observed. Results will be discussed in the context of micro-rheology experiments.

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