

Chemical Engineering Colloquium

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Dynamics of nanoparticles in polymer solutions

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Transport of nanoscale particles through crowded confined matrices is essential for drug delivery diagnostic assays and processing of nanocomposite materials. Because nanoparticles are comparable in size to heterogeneities within these matrices their transport properties may be altered by the local structure and dynamics within the complex fluid. I will discuss our recent work on nanoparticle transport in polymer solutions in which dynamic and structural length scales can be controlled through polymer concentration and molecular weight and hence serve as tunable model viscoelastic liquids. We use microscopy scattering and simulation methods to identify the mechanisms controlling the diffusion of a variety of particles including nanospheres viruses and polymer-grafted nanoparticles. This fundamental understanding of the coupling of nanoparticles dynamics to liquid relaxations will lead to better control over the spreading of nanoparticles through complex heterogeneous materials.

