SIMULATIONS OF PARTICLE TRANSPORT THROUGH COLLOIDAL GELS

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Porous systems are found throughout nature—the blood flow system, tissue (liver, cartilage, bone, tumors), aquifers, and membranes amongst others. The flow of complex fluids through these systems can be complicated by a number of factors, including interaction of the particle phase (if dealing with a suspension) with the boundaries, the dimensions of the porous system, etc. Numerical simulations can contribute valuable understanding to a number of fields, including tissue engineering and drug delivery.

In this paper we present a numerical study of particle transport through a heterogeneous colloidal gel using Brownian Dynamics simulations. We study the effect of the level of interaction of the free-floating particles with the particles composing the colloidal gel upon their diffusivity, varying from repulsion through attraction. The effect of the size differential between the free particles and the average pore size is also examined, and we are particularly interested in the behavior of very small particles traveling through the network.

Keywords: Brownian dynamics, colloidal gels