Flow and transport of colloidal suspensions in porous media studied by Hydrodynamically Coupled Brownian Dynamics

정재환, 안경현†
서울대학교
(ahnnet@snu.ac.kr†)

When colloidal suspensions flow through the porous media, particles are accumulated in the porous structure. These aggregation and deposition of the particles disturb the fluid flow, then lead to inaccessible pore volume, high retention time, and delay of material transport. In attempts to describe the accumulation of the particles, Hydrodynamically Coupled Brownian Dynamics is employed for simulating the motions of the colloidal suspensions. HCBD is the two-way coupling methodology that couples the motions of particles described from Brownian dynamics with the motions of the fluid blobs calculated from the Smoothed Particle Hydrodynamics. In HCBD, particles are influenced by the background fluid velocity field, which is calculated by solving Navier-Stokes equation on a moving grid of fluid blobs in SPH simulation. In this study, The performance of the HCBD method is demonstrated by calculating the efficiency of colloid delivery to the surface in the Happel sphere-in-cell geometry. Furthermore, particle aggregation and deposition mechanism are observed at the pore scale influenced by hydrodynamic interaction.