Abstract Submitted
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Flow effects on the formation of nanoparticle aggregates in packed beds[1] DIMITRIOS PAPAVASSILIOU, NGOC PHAM, The University of Oklahoma — Aggregation of nanoparticles in porous media may give rise to pore clogging and sedimentation, which are undesirable phenomena in stable dispersing systems. In addition, deposited/settled aggregates might serve as secondary collectors for further attachment of suspended nanoparticles. In this work, the transient mean size of nanoparticle systems, propagating in packed beds is numerically explored. Primary nanoparticles can interact with each other to form aggregates with a known aggregation probability. The velocity fields in the packed-sphere beds are generated by using the lattice Boltzmann method for single phase flow. In conjunction with that, a Lagrangian framework [1, 2] is employed to track the positions of the nanoparticles at every simulation step. We explore the change of the transient mean size under different hydrodynamic conditions (pore velocity, primary particle size, particle concentration, aggregation probability). An empirical correlation, predicting the final mean size of aggregates under given hydrodynamic conditions, is also obtained.
References 1. R. S. Voronov, S. VanGordon, V. I. Sikavitsas, D. V. Papavassiliou, Int. J. Num. Methods Fluids, 67, 501-517, 2011 2. N.H. Pham, D.P. Swatske, J.H. Harwell, B-J Shiau, D.V. Papavassiliou, Int. J. Heat & Mass Transf. 72, 319-328, 2014

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