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Particle Dynamics from Aerosol Flow

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Packed beds are well known for their vast and diverse applications in science and technology [1,2]. An accurate evaluation of the permeability of packed beds is critical for predicting fluid flow rates. In this study, we report the results of three-dimensional simulations of creeping flow through packed beds with porosities between 0.20 and 0.85. Our numerical results demonstrate that in this range, permeability is an exponential function of the porosity. This result is found to be in good agreement with experimental data. In addition, we compare our simulation results with some permeability-porosity relationship available in literature. We found that Carman–Kozeny's correlation agrees very well with our results for porosities up to 0.7 and Koponen et al.'s relationship holds well for porosities higher than 0.7. Based on the results obtained in this study, a new permeability-porosity relationship is presented, for the model system used.
Particles with different sizes are also modeled under steady- state laminar flow conditions in this packed bed geometry. For this purpose, a numerical simulation is performed to resolve the fluid flow and particles trajectories.

[1] Nield D., Bejan A. Convection in Porous Media, Springer-Verlag, New York, 1999
[2] Bejan A, Dincer I, Lorente S, Miguel A F, Reis A H. Porous and Complex Flow Structures in Modern Technologies, Springer-Verlag, New York, 2004