Abstract Submitted
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Porosity-Permeability Relations in Granular, Fibrous and Tubular Porous Media[1] FENG XIAO, XIAOLONG YIN, Petroleum Engineering Department, Colorado School of Mines — A Voronoi diagram-based stochastic geometry generator was developed to generate porous media models of granular, fibrous and tubular types. By adjusting geometry parameters such as number of random seeds and width of channels between grains or radius of fibers/tubes, homogenous and isotropic models of porous media with specified porosity can be accurately generated. The relation of porosity to geometry parameters was proven to be repeatable, and additional manipulations on geometries were built in, including creation of anisotropy and heterogeneity. A parallelized Lattice Boltzmann simulator with nearly ideal speedup was developed and employed to study porosity-permeability relations. Simulation data obtained in the porosity range of 0.01-0.4 revealed that properly normalized permeability in tubular porous media is higher than that in the granular type when porosity becomes greater than 0.1, which can be explained by its more efficient use of the pore space to conduct the flow. Simulation data obtained from fibrous media in solid volume fraction range of 0.01-0.4 agreed with published results, and showed a rapid change with solid volume fraction in the dilute limit.

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