Nanotechnology - Nanoporous; Reports Outline Nanoporous Study Findings from University of Texas Austin (Upscaling Water Flow In Composite Nanoporous Shale Matrix Using Lattice Boltzmann Method)

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2020 JUN 29 (VerticalNews) -- By a News Reporter-Staff News Editor at Nanotechnology Weekly -- Investigators publish new report on Nanotechnology - Nanoporous. According to news reporting originating in Austin, Texas, by VerticalNews journalists, research stated, "Water flow in nanoporous structures in shale strongly depends on water-pore wall interactions; specifically, water-pore wall interactions may influence flow more than water-water interactions. Because of strong water-pore wall interactions, the models that govern flow in nanoporous structures deviate from conventional continuum flow models such as the Darcy equation."

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The news reporters obtained a quote from the research from the University of Texas Austin, "We develop a novel lattice Boltzmann model to study water flow in nanoporous structures rendered from shale samples. First, we reconstruct three-dimensional (3-D) stochastic digital models based on composite shale samples that include hydrophobic organic matter (OM) and hydrophilic clay minerals. In the reconstructed digital models, we use pore size/shape distributions, porosity, and mineralogy from experiments. Then we use lattice Boltzmann models to model water flow through nanoporous structures (OM and clay) of the reconstructed shale sample, and we upscale the results to a microporous structure of composite shale containing OM, clay, and interpores associated to other minerals. The results show contraction/expansion effects of pore-throat-pore systems in nanoporous OM weaken the hydrophobicity-induced slippage effect on total water flow. In nanoporous clay, the swelling effect predominates and diminishes water slippage effects on water flow. The work also highlights the importance of (1) the accuracy of reconstructed 3-D pore networks in terms of pore connectivity, shape, and tortuosity in individual systems of OM and clay and (2) the role of OM nanopores in connecting isolated micropores to total water flow through the composite shale system."

According to the news reporters, the research concluded: "Key Points Multiscale digital shales are reconstructed, which is input to LBMs to study nanoscale effects on water flow at pore scale and REV scale The contraction/expansion effects of pore-throat-pore systems in OM considerably weaken the hydrophobicity-induced slippage When scaled up from nanoporous to microporous media, the nanoscale effects on water flow capacity decrease notably."

For more information on this research see: Upscaling Water Flow In Composite Nanoporous Shale Matrix Using Lattice Boltzmann Method. Water Resources Research, 2020;56(4):. Water Resources Research can be contacted at: Amer Geophysical Union, 2000 Florida Ave NW, Washington, DC 20009, USA. (American Geophysical Union - www.agu.org; Water Resources Research - www.agu.org/journals/wr/)

Our news correspondents report that additional information may be obtained by contacting F. Javadpour, University of Texas Austin, Bur Econ Geol, Jackson School of Geosciences, Austin, TX 78712, United States. Additional authors for this research include T. Zhang, X.F. Li and Y. Yin.

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