Nanotechnology - Nanoporous; Findings from China University of Petroleum Has Provided New Data on Nanoporous (Pore-scale Perspective of Gas/water Two-phase Flow In Shale)

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2021 JUN 7 (VerticalNews) -- By a News Reporter-Staff News Editor at Nanotechnology Weekly -- Current study results on Nanotechnology - Nanoporous have been published. According to news reporting originating from Beijing, People's Republic of China, by VerticalNews correspondents, research stated, "The transport behaviors of both single-phase gas and single-phase water at nanoscale deviate from the predictions of continuum flow theory. The deviation is greater and more complex when both gas and liquid flow simultaneously in a pore or network of pores."

Financial supporters for this research include National Natural Science Foundation of China (NSFC), Science Foundation of China University of Petroleum, Beijing, NanoGeosciences Laboratory at the **Bureau of Economic Geology**, Mudrock Systems Research Laboratory at the **Bureau of Economic Geology**, China Scholarship Council.

Our news editors obtained a quote from the research from the China University of Petroleum, "We developed a pseudopotential-based lattice Boltzmann (LB) method (LBM) to simulate gas/water two-phase flow at pore scale. A key element of this LBM is the incorporation of fluid/fluid and fluid/solid interactions that successfully capture the microscopic interactions among phases. To calibrate the model, we simulated a series of simple and static nanoscale two-phase systems, including phase separation, a Laplace bubble, contact angle, and a static nanoconfined bubble. In this work, we demonstrate the use of our proposed LBM to model gas/water two-phase flow in systems like a single nanopore, two parallel nanopores, and nanoporous media. Our LBM simulations of static water-film and gas-film scenarios in nanopores agree well with the theory of disjoining pressure and serve as critical steps toward validating this approach. This work highlights the importance of interfacial forces in determining static and dynamic fluid behaviors at the nanoscale. In the Applications section, we determine the water-film thickness and disjoining pressure in a hydrophilic nanopore under the drainage process. Next, we model water imbibition into gas-filled parallel nanopores with different wettability, and simulate gas/water two-phase flow in dual-wettability nanoporous media. The results showed that isolated patches of organic matters (OMs) impede water flow, and the water relative permeability curve cuts off at water saturation [= 1-volumetric total organic carbon (TOC)]."

According to the news editors, the research concluded: "The residual gas saturation is also controlled by the volumetric TOC, ascribed to the isolation of organic patches by the saturating water; therefore, the gas relative permeability curve cuts off at water saturation (= 1-volumetric TOC)."

This research has been peer-reviewed.

For more information on this research see: Pore-scale Perspective of Gas/water Two-phase Flow In Shale. SPE Journal, 2021;26(2):828-846. SPE Journal can be contacted at: Soc Petroleum Eng, 222 Palisades Creek Dr, Richardson, TX 75080, USA.

The news editors report that additional information may be obtained by contacting Tao Zhang, China University of Petroleum, Beijing, People's Republic of China. Additional authors for this research include Jing Li, Xiangfang Li, Farzam Javadpour, Yulong Zhao and Liehui Zhang.

Keywords for this news article include: Beijing, People's Republic of China, Asia, Emerging Technologies, Nanoporous, Nanotechnology, China University of Petroleum.

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