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Engineering - Hydrologic Engineering; Reports on Hydrologic Engineering Findings from University of Texas at Austin Provide New Insights (Gas Relative Permeability and its Evolution During Water Imbibition in Unconventional Reservoir Rocks: Direct Laboratory Measurement and a ...)

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2019 DEC 13 (VerticalNews) -- By a News Reporter-Staff News Editor at Energy Weekly News -- New research on Engineering - Hydrologic Engineering is the subject of a report. According to news reporting out of Austin, Texas, by VerticalNews editors, the research stated, "Relative permeability has a significant impact on gas or oil and water production, and is one of the most complicated properties in unconventional reservoirs. Current understanding of relative permeability for unconventional reservoir rocks is limited, mainly because of a lack of direct measurement of relative permeability for rocks that have a matrix permeability at the submicrodarcy level."

Funders for this research include University of Texas at Austin Startup Fund for Sheng Peng, Project STARR (State of Texas Advanced Oil and Gas Resource Recovery) in the **Bureau of Economic Geology** at the University of Texas at Austin, Mudrock Systems Research Laboratory (MSRL) in the **Bureau of Economic Geology** at the University of Texas at Austin, MSRL member companies.

Our news journalists obtained a quote from the research from the University of Texas at Austin, "Because of the difficulties related to direct measurement, most studies on relative permeability in unconventional reservoirs are based on indirect or modeling methods. In this paper, a modified gas-expansion method for shale matrix-permeability measurement (Peng et al. 2019) was adopted to measure gas relative permeability directly under the scenario of water imbibition for samples from different unconventional reservoir formations. Evolution of gas permeability, along with gas porosity and fracture/matrix interaction, during the process of water redistribution (which mimics what occurs in the shut-in period in real production) was also closely measured. Results show that gas relative permeability in the matrix decreases during water redistribution because of water imbibition from fractures to the matrix coupled with a water-block effect. The water-block effect is more significant at low water saturations than at higher water saturations, leading to a rapid-to-gradual drop of gas relative permeability with increasing water saturation. A conceptual model on water redistribution in a fracture/matrix system and the change of gas and water relative permeability is proposed on the basis of experimental results and observations. Influencing factors including pore size, shape, connectivity, and wettability are taken into account in this conceptual model. The combined effect of these four influencing factors determines the level of residual gas saturation, which is the most important parameter in defining the shape of relative permeability curves. Water relative permeability is predicted on the basis of the conceptual model and the measured gas relative permeability using modified Brooks-Corey equations. Deducing the oil/water relative permeability is also discussed. The implications of relative permeability for gas or oil and water production and potential strategies for optimal production are also discussed in the paper."

According to the news editors, the research concluded: "The hysteresis effect is not included in this study but will be addressed in future work."

For more information on this research see: Gas Relative Permeability and its Evolution During Water Imbibition in Unconventional Reservoir Rocks: Direct Laboratory Measurement and a Conceptual Model. SPE Reservoir Evaluation & Engineering, 2019;22(04):1346-1359. SPE Reservoir Evaluation & Engineering can be contacted at: Soc Petroleum Eng, 222 Palisades Creek Dr, Richardson, TX 75080, USA.

Our news journalists report that additional information may be obtained by contacting S. Peng, University of Texas - Austin, Bur Econ Geol, Austin, TX 78712, United States.

Keywords for this news article include: Austin, Texas, United States, North and Central America, Hydrologic Engineering, Engineering, University of Texas at Austin.

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