Solid Earth Research; Study Results from University of Texas at Austin Provide New Insights into Solid Earth Research (Tracer-guided Characterization of Dominant Pore Networks and Implications for Permeability and Wettability In Shale)

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2019 MAY 10 (NewsRx) -- By a News Reporter-Staff News Editor at Science Letter -- Investigators publish new report on Solid Earth Research. According to news reporting from Austin, Texas, by NewsRx journalists, research stated, "Pore network characterization is an important aspect in unconventional reservoir evaluation. While application of the technique of scanning electron microscope (SEM) brings substantial advances in pore characterization in shale, understanding the connected pore network that dominates flow in shale samples is limited by using SEM alone because of small fields of view and lack of views of connectivity in 3D."

Financial supporters for this research include University of Texas at Austin Jackson School of Geosciences Startup Fund, Mudrock Systems Research Laboratory (MSRL), Project STARR (State of Texas Advanced Oil and Gas Resource Recovery) at the **Bureau of Economic Geology** at UT Austin, MSRL, U.S. DOE.

The news correspondents obtained a quote from the research from the University of Texas at Austin, "In this research, a technique integrating tracer imbibition, micro-computed tomography (CT) imaging, and SEM imaging was developed to provide a solution for multiscale imaging in shale. Tracer imbibition indicates pore connectivity; micro-CT imaging after tracer imbibition thus provides an overview of the connected pore network at the millimeter scale. With guidance from micro-CT images after tracer imbibition, a more accurate and detailed characterization of pore systems and related mineralogy can be conducted using higher-resolution SEM. The method was applied to five samples from Wolfcamp and Eagle Ford Formations. Results reveal the effectiveness of the integrated method by showing different patterns of distribution of the dominant pore network and different controlling mineralogy. Dominant porosity, estimated from grayscale analyses, displays a good correlation with permeability. This result indicates that dominant porosity is more relevant to permeability than is total porosity. Results from imbibition tests are also compared with that from contact angle measurement, and important implications on wettability can be obtained. The integrated method thus has the capacity to link the dominant pore network and wettability with microscale to submicroscale mineralogy, which can help better understand the pore systems and fluid flow in shale. Plain Language Summary Pore network characterization and wettability are two important aspects in unconventional reservoir evaluation and are crucial to understanding the nature of shale oil or gas storage and production. A new technique integrating tracer imbibition, micro-computed tomography imaging, and scanning electron microscope imaging was developed for a more representative and effective pore characterization in shale. This integrated technique can provide a direct visualization of the dominant pore network in a millimeter-scale sample and, at the same time, can provide a guided pore network characterization under nanoscale resolution. This method thus can generate results that are more representative and more accurate in a more efficient way compared with the traditional scanning electron microscope method. The new technique can also reveal the local wettability in microscale."

According to the news reporters, the research concluded: "High-resolution analysis on the tracer imbibition or fluid displacement and mineralogy can shed light on the local wettability and the controlling mineralogy in shale."

For more information on this research see: Tracer-guided Characterization of Dominant Pore Networks and Implications for Permeability and Wettability In Shale. Journal of Geophysical Research Solid Earth, 2019;124(2):1459-1479. Journal of Geophysical Research Solid Earth can be contacted at: Amer Geophysical Union, 2000 Florida Ave NW, Washington, DC 20009, USA.

Our news journalists report that additional information may be obtained by contacting S. Peng, University of Texas - Austin, Bur Econ Geol, Jackson School of Geosciences, Austin, TX 78712, United States. Additional authors for this research include R.M. Reed, X.H. Xiao, Y. Yang and Y.J. Liu.

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