The Importance of Meso- and Microporosity in Shale Gas Capacity

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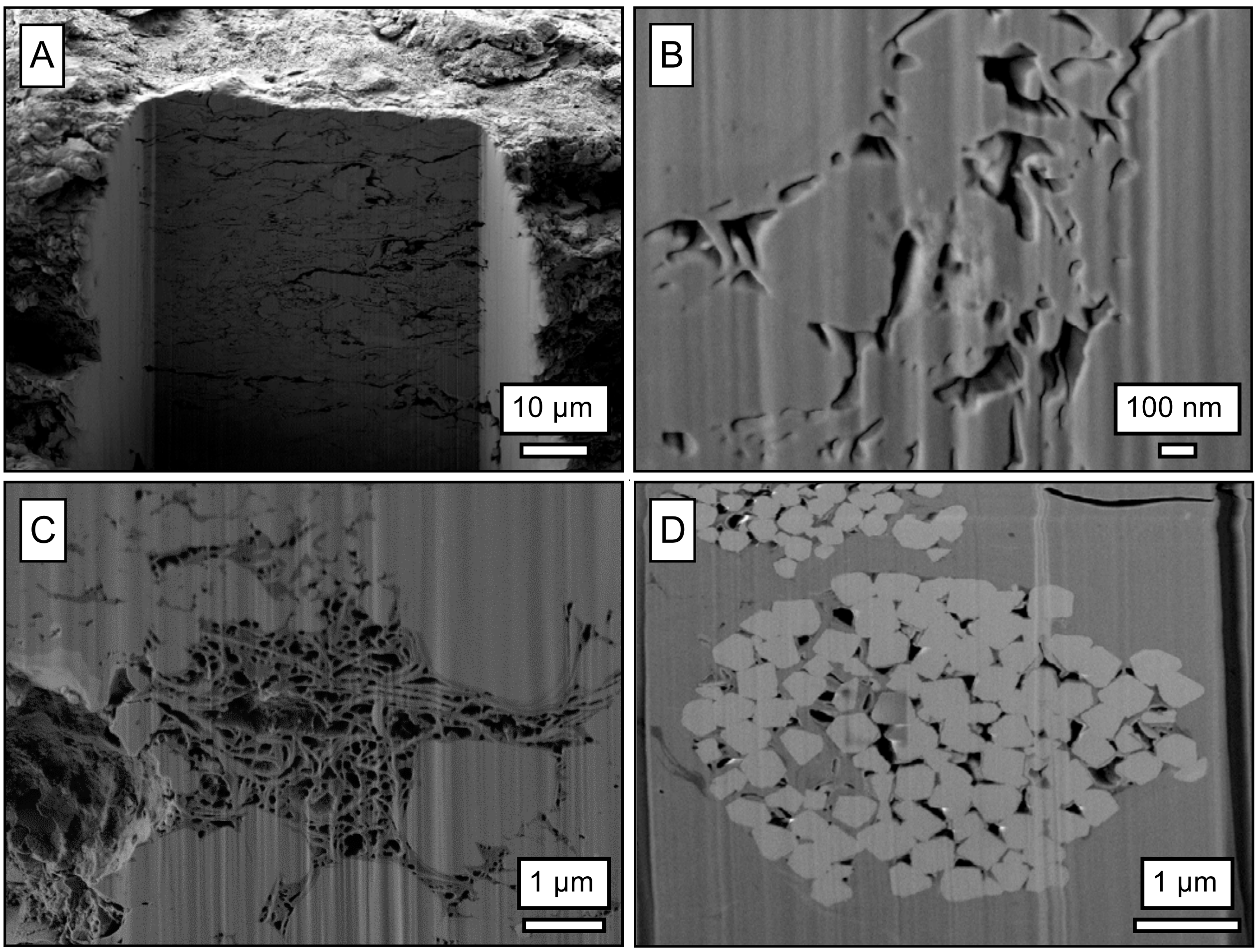
In organic-rich shales, a significant portion of the total porosity is within the size ranges of 50 to 2 nm (mesopores) and <2 nm (micropores). Using the U.S. Barnett and Haynesville shales and the Canadian Buckinghorse and Shaftesbury shales as examples, we identify the pore size distribution and mineralogy to evaluate the importance of the meso- and microporosity in controlling the methane capacity.



At the Western Nanofabrication Facility, cross-sections (A) of the shale samples were milled using the focused ion beam (FIB) and high resolution images were obtained using LEO 1540XB FIB/SEM. This technique allowed for the imaging of the of pore spaces at the meso-/micropore boundary (B). A positive relationship exists between microporosity and methane sorption capacity of a shale as microporosity is primarily associated with organic matter (C), which may also form framboidal pyrite (D). Meso- and microporosity in gas shales have two significant impacts: 1) they are a major contributor to the surface area for sorption of methane molecules and 2) they increase the total porosity of the sample and hence the free gas component.

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