Petrographic Characterization of Mudstones

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The mineralogy and porosity of Paleozoic to Tertiary mudstones from a variety of depositional environments, burial depths, thermal maturities, and compositions are examined in an effort to understand producibility of shale-gas reservoirs. To probe the relationship between lithologic compositions, reservoir quality and petrophysical properties, scanning electron microscope (SEM) observations of ion-milled sections are integrated with core descriptions, petrographic thin section observations, and geochemical and mineralogical data within their stratigraphic and regional geology framework.

Our research suggests that Ion milling/SEM techniques enhance the identification and quantification of porosity, mineralogy and diagenetic history of reservoir mudstones. SEM observations of ion-milled sections are presented to illustrate porosity types, size and occurrence. Porosity in mudstones is found in mature organic matter and mineral matrix. Porosity in organic matter is more common in samples from higher maturity mudstones. Pores in organic matter have a variety of sizes and shapes. Some porosity suggest flow, other seems to be related to wettability. Pores in mineral matrix are observed in clay matrix, between clay draping diagenetic and detrital grains, and often related to growth of diagenetic minerals (silica, carbonate, pyrite).

Future investigations will include the analysis of petrophysical properties such as porosity, permeability, pore size distribution, and fluid flow pathways in 3-D.