

**Petrology and Petrophysics of Middle Devonian/Middle Silurian Potential CO<sub>2</sub> Sequestration Reservoirs in the Central Appalachian Basin**, Christopher D. Laughrey, Jaime Kostelnik, Kristin M. Carter, and John A. Harper, Pennsylvania Geological Survey, Pittsburgh, PA 15222, [claughrey@state.pa.us](mailto:claughrey@state.pa.us)

We are evaluating four subsurface stratigraphic units in the Central Appalachian Basin for potential geologic sequestration of carbon dioxide (CO<sub>2</sub>). These include the Lower Devonian Oriskany Sandstone, Upper Silurian Bass Islands Dolomite, Middle Silurian Lockport Dolomite, and Middle Silurian Keefer Sandstone.

The Oriskany Sandstone interval consists of quartzarenite, calcareous sandstone, and arenaceous biosparite. Pore-filling cements include quartz, calcite, dolomite, glauconite, chalcedony, pyrite, and illite. Intergranular, moldic, and fracture porosity provide the fluid storage capacity of the rocks. Porosity ranges from less than 2 to 20 percent, and permeability ranges from less than 0.1 to 30 millidarcy (md).

The Bass Islands Dolomite consists of fine to medium crystalline planar-p dolostone and dolomitic packed biopelmicrite. Lithodensity logs indicate the rocks are often siliceous. Thin section analysis reveals that chert and quartz replace planar dolomite. Petrography and log analysis indicate moldic, vuggy, and fracture porosity in this unit. Porosity ranges from 1 to 6 percent and permeability is typically less than 0.1 md.

The Lockport Dolomite originated as shallowing upwards facies on a broad carbonate platform across the Central Appalachian Basin. The rock fabrics in the Lockport are the product of marine and freshwater diagenesis and hydrothermal burial dolomitization. Vuggy, moldic, and intercrystalline voids create a dual porosity-permeability distribution. Potential CO<sub>2</sub> sequestration reservoirs are limited to vuggy and moldic intervals in biohermal and biostromal lithofacies with an average porosity of almost 10 percent and mean horizontal permeability of 50 md.

The Keefer Sandstone consists of very fine- to coarse-grained sublitharenite and quartzarenite deposited in littoral to shallow marine environments. These sandstones are cemented by quartz, anhydrite, gypsum, calcite, and dolomite. Porosity ranges from 1 to 20 percent, but averages only 5 percent. Void types include primary and secondary intergranular porosity and open fractures.