

Geological Characterization of Lower Cretaceous Pine Island (Pearsall Formation) Shales as a Potential Resource Play in the Maverick Basin, South Texas: An Update

Hackley, Paul¹ (1) USGS MS 956, Reston, VA.

Pine Island Shale (Pearsall Formation) core samples were evaluated as part of ongoing U.S. Geological Survey assessment of undiscovered hydrocarbon resources in onshore Lower Cretaceous strata of the northern Gulf of Mexico. Porosity-permeability measurements, X-ray diffraction mineralogy, and thin section evaluation were used to characterize core samples from three wells in Maverick County and one well in Bee County, Texas.

Previous USGS work indicated that Pearsall Formation rocks are in the dry gas window at depths of 5,000-16,000 ft across the Maverick Basin ($R_o \geq 1.2\%$). However, based on low TOC (avg. 0.8%) and pyrolyzable hydrocarbon content (S2 avg. 0.5 mg HC/g), the Pearsall is an overall lean source rock compared to other gas shale plays. Kerogen dominantly is gas-prone Type III (vitrinite), reflecting terrestrial sediment input into an oxygenated shallow marine carbonate platform basin with open circulation.

The core samples consist of weakly laminated calcareous mudstones and wackestones. Planktonic foraminifera are present in fine-grained distal mudstones in a clay and carbonate matrix. Coarser-grained proximal wackestones contain angular detrital quartz clasts and planktonic bioclasts are sparse or absent.

X-ray diffraction (XRD) patterns for eighteen core samples indicate the ubiquitous presence of carbonates (~10-65%; avg. 35%), clays (~15-55%; avg. 35%), and quartz (~10-45%; avg. 20%). Mineralogical composition is highly variable; however, carbonates and clays predominate whereas quartz content varies inversely with carbonate and is the dominant phase in only one of the samples. The low quartz content suggests that Pearsall rocks may not respond to fracture stimulation treatments similar to those used on the brittle, quartz-rich Barnett Shale.

Conventional petrophysical measurements on five core samples indicate that porosity ranges 6-10%, similar to that reported in other gas shales, e.g., the Haynesville and Barnett. Permeability measurements range 0.003-0.062 mD, higher than reported for other gas shales; however, these values probably are optimistic as the samples were desiccated through decades of storage and contain artificial bedding plane partings. Macroscopic mineralized fractures were not readily apparent in the examined cores; rare carbonate-filled microfractures were observed in some thin sections.