



Preliminary vitrinite and bitumen reflectance, total organic carbon, and pyrolysis data for samples from Upper and Lower Cretaceous strata, Maverick Basin, south Texas

By Paul C. Hackley, Kristin O. Dennen, Rachel M. Gesserman, and Jennie L. Ridgley

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Introduction

The Lower Cretaceous Pearsall Formation, a regionally occurring limestone and shale interval of 500–600-ft maximum thickness (Rose, 1986), is being evaluated as part of an ongoing U.S. Geological Survey (USGS) assessment of undiscovered hydrocarbon resources in onshore Lower Cretaceous strata of the northern Gulf of Mexico.

The purpose of this report is to release preliminary vitrinite and bitumen reflectance, total organic carbon, and pyrolysis data for Pearsall Formation, Glen Rose Formation, Hosston Formation, Austin Group, and Eagle Ford Group samples from the Maverick Basin in south Texas in order to aid in the characterization of these strata in this area. The preliminary nature of this report and the data contained herein reflect that the assessment and characterization of these samples is a work currently in progress.

Pearsall Formation subdivisions are, in ascending stratigraphic order, the Pine Island Shale, James Limestone, and Bexar Shale Members (Loucks, 2002). The Lower Cretaceous Glen Rose Formation is also part of the USGS Lower Cretaceous assessment and produces oil in the Maverick Basin (Loucks and Kerans, 2003). The Hosston Formation was assessed by the USGS for undiscovered oil and gas resources in 2006 (Dyman and Condon, 2006), but not in south Texas.

The Upper Cretaceous Austin Group is being assessed as part of the USGS assessment of undiscovered hydrocarbon resources in the Upper Cretaceous strata of the northern Gulf of Mexico and, along with the Upper Cretaceous Eagle Ford Group, is considered to be an important source rock in the Smackover-Austin-Eagleford Total Petroleum System (Condon and Dyman, 2006). Both the Austin Group and the Eagle Ford Group are present in the Maverick Basin in south Texas (Rose, 1986).

Methodology

Spontaneous potential-resistivity logs for 26 conventional wells in the Maverick basin were evaluated to correlate the stratigraphic positions of the Pearsall Formation, Glen Rose Formation, Hosston Formation, Austin Group, and Eagle Ford Group. Cuttings and core available from the Texas Bureau of Economic Geology for these wells were sampled and prepared for petrographic, geochemical, and other analyses. For comparison purposes, samples were also collected from Pearsall equivalent outcrops in western Travis County, Texas, on the San Marcos Arch (the Pearsall Formation does not outcrop in the Maverick Basin).

Samples were prepared and analyzed for reflectance at the USGS according to the protocols outlined on the USGS Organic Petrology Laboratory Web page at http://energy.er.usgs.gov/coal_studies/organic_petrology/laboratory.html. Samples were analyzed for total organic carbon and programmed pyrolysis by Weatherford Laboratories according to standard analytical procedures. Preliminary vitrinite reflectance, TOC, and pyrolysis data are compiled in table 1.

Description of Data for Table 1

A table containing variable headings and explanations for table 1 appears below.

Table 1. Preliminary vitrinite and bitumen reflectance, TOC, and pyrolysis data for Upper and Lower Cretaceous age samples from the Maverick Basin, south Texas.

Variable Heading	Description or Explanation
API Number	A unique number that identifies a well site and cores taken from that well in public well records. It specifies the State, the county or parish, and a permit number for the well issued by the State in which the well is drilled. The API numbers for the wells in this report are publicly available from the Texas Bureau of Economic Geology.
Lease/Well Name	Most wells are named for the person leasing or owning the land where the well is drilled. If multiple holes are drilled on a property, the name is usually followed by a number.
County	County in which the well is located.
Formation or Member	Geologic name of formation or member from which sample was taken.
Top Depth (ft)	Minimum depth of core interval from which sample was taken.
Bottom Depth (ft)	Maximum depth of core interval from which sample was taken.
Sample Type	Core indicates that samples were taken directly from the core. Cuttings are pieces of material brought up from the well during drilling.
TOC	Total organic carbon content of sample in weight percent.
S ₁	Milligrams (mg) of free organic compounds/g of sample.
S ₂	mg of hydrocarbons derived from kerogen, resins, and asphaltenes/g of sample.
S ₃	mg CO ₂ /g of sample released between 300 and 390°C.
T _{MAX}	Temperature from pyrolysis analysis corresponding to maximum S ₂ production in °C.
Calculated %R _o	Calculated $R_o = 0.0180 \times T_{max} - 7.16$ (Jarvie and others, 2001).
Measured %RO	Mean value of percent reflectance measurements of vitrinite and (or) bitumen in oil (ASTM, 2008).
HI	Hydrogen index = mg S ₂ /g TOC x 100.
OI	Oxygen index = mg S ₃ /g TOC x 100.
PI	Production index = S ₁ /S ₁ + S ₂ .
n.d.	No data. Either the analytical laboratory reporting the results did not provide this information, or in the case of measured %R _o , the analyses are ongoing, reflecting the preliminary nature of this report. %R _o data for these samples will be provided in later reports.

Acknowledgments

James Donnelly of the Texas Bureau of Economic Geology coordinated shipment of Pearsall core and cuttings samples to the USGS. Timely, but thorough, reviews from Mark J. Pawlewicz and John SanFilipo of the USGS greatly improved this report.

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