Organic Petrology and Vitrinite Reflectance of the Taylor and Navarro Groups in Maverick Basin, Texas, USA

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ABSTRACT

The Maverick Basin in Texas lies at the southern end of an area of widespread petroleum production from the Eagle Ford Shale and over- and underlying reservoirs. Important questions about petroleum charge history and the reasons for anomalous thermal maturity in the Maverick Basin remain unanswered and lead to uncertainty in estimation of undiscovered oil and gas resources. In this report we integrate previously acquired vitrinite reflectance (%VRo) data with new %VRo measurements and organic petrography observations, in support of an upcoming petroleum assessment of the Taylor and Navarro groups by the U.S. Geological Survey.

Twelve new samples were collected from outcrop and core. Organic material in the Olmos Formation (Navarro Group) is mostly detrovitrinite with some telovitrinite, amorphous organic material (AOM), sporinite, and fusinite. Preliminary results of data collected on new Olmos samples indicate 0.55–0.67 %VRo. Outcropping strata in updip positions in Maverick County exhibit 0.55–0.60 %VRo. These values are similar to previously cited %VRo values of 0.53 in the San Miguel Formation (Taylor Group) and 0.58 in the Olmos Formation, and congruent with 0.28 solid bitumen reflectance (%BRo) from the overlying Escondido Formation (Navarro Group). By contrast, strata from shallow coal-bed methane wells approximately 20 km down depositional dip, at present depths of about 500 m, exhibit a higher value of 0.67 %VRo.

New reflectance data will be integrated with previously published reflectance measurements taken from underlying Cretaceous formations to establish vitrinite reflectance gradients with depth and approximate thermal gradients at the time of maximum thermal maturity. Specifically, extant data from underlying formations show 0.6–1.89 %BRo in the Eagle Ford Shale, and %VRo values of 1.22–2.26 in the Lower Cretaceous units. Paleo-thermal gradients will be an important constraint on models of the timing of petroleum generation across the region.

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