

Organic Matter Characterization for Unconventional Reservoir Potential Assessment of the Murray Harbour Formation in the Sverdrup Basin, Arctic Canada

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Abstract

This study focuses on organic matter characterization of the Middle Triassic Murray Harbour Formation. Preliminary Rock Eval 6 analysis and organic petrologic results have been obtained from closely spaced samples (every 20 cm) of three cores taken from the west-central Sverdrup Basin in the Canadian Arctic islands. Each core is from a different stratigraphic level of the Murray Harbour Formation, and from wells located in progressively deeper parts of the basin. Total organic carbon (TOC) ranges from 0 to 4.8 wt. % for all the wells, with two of the intervals having a median TOC value of greater than 3 wt. %. Samples from two of the wells are within the oil generation window and samples from the third well are at the beginning of the oil generation window.

Organic petrologic results from each of the three cores highlight both similarities and differences in the character of the organic matter. Significant degraded, reworked organic matter is present in most samples, including vitrinite, inertinite and microfossil fragments. For this reason, the thermal maturity of organic matter was determined using reflectance of in-situ bitumen as opposed to vitrinite. Liptinitic algal material and bitumen dispersed within matrix clay fluoresce under ultraviolet light, indicating remaining hydrocarbon generation potential. Pore-filling bitumen is present in varying quantities, and in one core, has higher reflectance values than those derived from T_{max} values. These variable bitumen reflectance values suggest oxidation of organic matter and early generated hydrocarbons via bacterial sulphate reduction. Bacterial sulphate reduction likely began at deposition and continued throughout burial, resulting in a wide range of reflectance values.

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