

Hydrocarbon Source Rock Potential As Determined By Rock-Eval 6/TOC Pyrolysis, N.E. B.C. And N.W. Alberta

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ABSTRACT

The potential for conventional and/or unconventional hydrocarbon exploration requires the presence of organic-rich, thermally mature rock units containing oil or gas-prone kerogen. This potential is poorly known in large parts of northeastern B.C. and northern Alberta due to a paucity of organic geochemical studies. Here, we investigate Lower Triassic to Lower Cretaceous potential source rocks within a large area of northeastern British Columbia and northwestern Alberta (118°-124°W and 57°- 58°N). Hydrocarbon source rock parameters, including type and amount of kerogen, and thermal maturity of these formations, are assessed by analyzing 74 core samples from 23 wells using Rock-Eval 6/TOC pyrolysis.

In general all units are immature in northwestern Alberta with increasing maturity to the west where they become overmature. The Lower Triassic Montney Formation contains Type II kerogen with TOC (Total Organic Carbon) values up to 4.2 wt.%, suggesting that this unit generated significant amount of hydrocarbons where it is mature. The base of the Doig Formation comprises a highly radioactive zone, the "Phosphate Zone" which contains Type II kerogen with TOC values up to 11 wt. %, and is an excellent hydrocarbon source rock. The Upper Triassic Baldonnel and Pardonet formations are late mature to overmature where sampled. The Baldonnel Formation yields up to 1.4 wt.% TOC indicating only poor to fair source rock potential. The Pardonet Formation contains residual TOC values up to 2.8 wt.%, which suggests this marine unit may have initially been a good source rock for hydrocarbons, but is now spent.

The Lower Jurassic Gordondale Member comprises Type II kerogen with TOC values up to 9.5 wt.%, indicating that this unit is an excellent hydrocarbon source rock. The Lower Cretaceous Wilrich Shale is also of interest, as it has been suggested as a potential target for shale gas exploration. This unit is immature to mature within the study area. It contains Type III kerogen with TOC values up to 4.28 wt.%.

Our results indicate very good to excellent petroleum potential within the study area in B.C. and Alberta. Quantitative 1-D modelling (see abstract by Ibrahimbas and Riediger) utilizes the source rock data shown in this presentation. Additional geochemical studies (oil-oil and oil-source rock correlations) are needed to fully elucidate petroleum systems.