



Evaluation of shale gas potential based on organic matter characteristics and gas concentration in the Devonian Horn River Formation, Canada

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In this study, we investigate organic matter characteristics from the analysis of Rock-Eval6 and biomarker, and estimate methane concentration from headspace method in the Devonian Horn River Formation, which is one of the largest shale reservoir in western Canada. The Horn River Formation consists of the Evie, Otterpark and Muskwa members in ascending stratigraphic order.

Total Organic Carbon (TOC) ranges from 0.34 to 7.57 wt%, with an average of 2.78 wt%. The Evie, middle Otterpark and Muskwa members have an average TOC of more than 3%, whereas those of the lower and upper Otterpark Member are less than 2%. Based on Pristane/n-C17 (0.2 ~ 0.6) and Phytane/n-C18 (0.3 ~ 0.9) ratios, the organic matter in the Evie, middle Otterpark and Muskwa members mainly consists of type II kerogen which are formed in reducing marine environment. Thermal maturity were examined through the use of the distributions of Phenanthrene (P) and Methylphenantrenes (MP) based on m/z 178 and 192 mass chromatograms, respectively (Radke et al., 1982). The methylphenanthrene index (MPI-1) are calculated as follows : $MPI-1 = 1.5 \times (2MP+3MP)/(P+1MP+9MP)$, and Ro are calculated as follows : $Ro = -0.6 \times MPI-1 + 2.3$. Estimated Ro ranges between 1.88 and 1.93%, which indicates the last stage of wet gas generation. The methane concentrations in headspace range from 15 to 914 ppmv, with an average of 73.5 ppmv. The methane concentrations in the Evie, middle Otterpark and Muskwa members (up to 914 ppmv) are higher than those of the lower and upper Otterpark Member (up to 75 ppmv). Considering the organic geochemical characteristics and gas concentrations, the shale gas potentials of the Evie, middle Otterpark and Muskwa members are higher than those of other members.