

Estimation of the kerogen porosity (Φ_iK) within the Macasty Fm (Utica) of Anticosti Island, Qc, Canada

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Summary

The Anticosti Basin, located in the Gulf of St Lawrence, is part of the St Lawrence Platform. The oil-prone (Type II kerogen) organic rich Upper Ordovician Macasty Formation (Utica equivalent) is present over most of the island and constitutes an interesting emerging shale oil play. The 7892 km² island is about 225 kilometers long and 50 kilometers in its widest part. The Macasty Formation is lying on the Lower to Middle Ordovician St Lawrence carbonate platform. This platform dips gently toward the South. The Macasty is relatively thin (less than 10 meters) at the southeast tip of the island and thickens up to 120 meters at the western end. The formation is relatively shallower in the north-central part of the island (about 500 meters) and is as deep as 2200 meters in the southern part. Uplift during Late Devonian Acadian Orogeny and erosion explain the present day relatively shallow depths of the Macasty.

Only 23 wells (including 6 slim holes) have been drilled on the island. In 2010, a 27 meters continuous core was cut in the Macasty in the Petrolia-Corridor Chaloupe No 1 well and, in 2012, three stratigraphic mining slim holes were drilled in the western part of the island. These Macasty cores have been analyzed in terms of TOC, S1, S2, mineralogy and reservoir characteristics. Ro vitrinite-equivalent (Roe) from organoclasts reflectance and Roe from Tmax were also measured from surface to the top Mingan (Trenton) on wells and slim holes drilled on the island. Details Rock-Eval pyrolysis on Macasty cuttings intervals and core samples were done on the remaining wells.

Three steps were necessary to estimate the kerogen porosity (Φ_iK) within the Macasty Formation. The first step was to calculate the TOC from the Passey $\Delta\log R$ Method (Sonic-Resistivity overlay). This method, when calibrated with TOC from cores, gives continuous values of TOC for the Macasty interval. The second step was to calculate initial TOC with transformation ratio equations. The third step was to estimate the kerogen porosity from initial TOC.

The estimation of Φ_iK was done for each TOC value (measured and / or calculated) of the Anticosti wells and slim holes studied. Where logs and Roe were available for the Macasty, continuous values of TOC and Φ_iK has been obtained over the logged Macasty interval. In this last case, it was also possible to compare Φ_iK with Φ_iE from Neutron Density logs and to discriminate between matrix and kerogen porosities.