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Paper #194973**GEOCHEMICAL CHARACTERIZATION OF THE RESERVOIR HOSTING SHALE-GAS AND OIL in THE SUBSURFACE OF ANTICOSTI ISLAND, CANADA**

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Lower Ordovician to Lower Silurian marine sedimentary rocks are widely distributed in the NE part of North America along the Appalachians as they were deposited during the Taconic orogeny. These sedimentary rocks are limestones and fine-grained siliciclastic rocks. Among them, black shale forms a reservoir for shale-gas and oil. We examined organic-rich black shale, known as Macasty shale, of Upper Ordovician age from the subsurface of Anticosti Island in the St. Lawrence River. The shale is made of clay-size quartz grains cemented by calcite (8-17%), organic matter (7-9 %C) and pyrite (0.7-1.6 % S). It contains abundant pyritized, megascopic fossils, such as cephalopods and graptolites. Our shale samples contain 66 wt%SiO₂, 4.5 wt% Al₂O₃, and 1.7 wt%K₂O, which are similar to those of the North American Shale Composite. Low contents of Cr (< 90 ppm), Ni (< 70 ppm) and Co (< 24 ppm) suggest little to no significant contribution from mafic-ultramafic rocks. Our black shale is enriched in redox-sensitive elements, such as U (up to 13 ppm), As (7-9.5 ppm), Se (up to 3 ppm), Cu (up to 71 ppm), Sb (up to 1.5 ppm), and Pb (up to 21 ppm). Their high contents are consistent with their deposition in reducing environments. Sulphur isotope compositions for pyrite range from -2 to + 0.1 o/oo, suggesting that the deposition in a basin with a slightly restricted supply of fresh ocean water. Calcite has d¹³C values ranging from -2.8 to -2.5 o/oo and d¹⁸O from -10.4 to -8.6 o/oo (PDV), suggesting that marine carbonate values were slightly modified during the diagenesis at temperatures around 50-70 C or under the influence of surface waters. Isotope compositions of organic carbon (-29 to -22 o/oo) are similar to values of Ordovician sedimentary rocks in the area. Epsilon Nd values (t=0) range -13 to -14. The CHUR model ages are ~ 1300 to 1390 Ma, suggesting that the provenance of the black shale is Proterozoic igneous rocks. The ages coincide with those of abundant granitic igneous rocks in the Grenville Province.

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