

**Physicochemical Constraints of Shale Gas Potential Within Mississippian Horton Shale Sequences of New Brunswick and Nova Scotia, Eastern Canada: Dependency of Liquid and Gaseous Adsorptions**

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The unconventional shale gas resource plays of the Mississippian Horton Shale sequences of New Brunswick and Nova Scotia (Eastern Canada) were reevaluated based on the geochemical parameters and adsorption or desorption characteristics of the hydrocarbon gases. The regional study of the Horton Shale documented two issues: (a) the concentration of hydrocarbons is closely connected to major faults or thrusts in contrast to low structurally disturbed areas; and (b) the amount of adsorbed and free gases is related to the regional maturity, organic facies, and mineralogical variability. Moreover, this data also documents a close relationship with extractable liquid hydrocarbons, comparable absorption capabilities of individual organoclasts (macerals) in relation to mineral catalysts, and maturation within the shale network.

Our regional assessment of the gas adsorption and desorption in kerogen Type II, Type II-III, and III shale units of the Horton Group possibly implies two parallel gas adsorption phases (liquid and gas) at the same interval especially with the main to late phase of the oil generation (0.8 to 1.4% Ro). The variability of gas and liquid adsorptions may indicate presence of multiplayer phases (possibly using both Langmuir and BET equations) where adsorption is both pressure and temperature dependent. It is assumed that beyond 3% Ro, the adsorption sites within individual macerals (especially within the amorphous liptinitic types) will eventually diminish from highly active to semi-inert state. This phenomenon may partially balance the amount of free and adsorbed methane within the highly active shale network sites.