Composition and Maturity of Appalachian Coals from Nova Scotia: Their Relationship to Methane Generation and Adsorption, Development of Micropores and Permeability[1]

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Selected Carboniferous coal seams from the Sydney and Stellarton basins of Nova Scotia, eastern Canada, were evaluated to: (i) estimate the maximum capacity to hold free and adsorbed methane; (ii) better understand the kinetics of methane generation; (iii) understand the nature of migration avenues within the coal network for the desorption and expulsion of methane and C_2+ hydrocarbon gases; and (iv) demonstrate a correlation between methane-holding capacity and permeability versus coal composition and maturity.

Coal maturity and the amount of early generated oils within the coal network are the major parameters for the formation and expulsion of free hydrocarbon gases, although maceral composition has some influence. However, the kinetics of CH_4, C_2 + hydrocarbon gas generation is dependent both on coal composition and maturity. Analysis of samples with similar maceral assemblages shows the CH_4 adsorption capacity (mostly >300 SCF/ton) increases with a change in rank from high volatile bituminous to medium volatile bituminous. Permeability in the coal network under a pressure of one atmosphere is related to: (a) the nature of maceral assemblages; (b) maceral porosity; and (c) micro-cleat porosity (classified as types 1, 2, and 3). A high content of vitrinite macerals devoid of any micro-cleat porosity can yield a permeability as high as 5 md. Macerals with micro-cleat types 1 and 2 show permeabilities up to 20 md. Permeabilities beyond 20 md require a combination of maceral/minerals and fracture porosity (micro-cleat type 3).

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