Diagenesis and Reservoir Potential of Upper Carboniferous Sandstones in the Maritimes Basin, Eastern Canada

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The Maritimes Basin is a Late Paleozoic successor basin in the northern Appalachian Orogen. Despite the large size of the basin (>250,000 km^2), few mineral and hydrocarbon resources have been discovered so far, and a large portion of the basin remains under-explored. The upper part of the Maritimes Basin is composed of alternating sandstones and mudrocks deposited in continental environments. The sandstones in this succession represent potential reservoir rocks for hydrocarbons, especially coal-derived gas. The porosity of the sandstones is variable, and little has been known about the controlling factors.

This study focuses on diagenesis of sandstone samples collected from the Spring Valley #1 well which penetrates the Upper Carboniferous strata. Porosity values estimated from point counting range from zero to 27.8%, and show a clear linear decrease with depth, except for samples where porosity is completely occluded by abundant carbonate cement. A comparison of the porosity data with a theoretical compaction curve indicates that the upper and middle parts of the stratigraphic column show higher-than-normal porosity values, which are related to significant carbonate and feldspar dissolution, as indicated by petrographic studies.

Fluid inclusions in quartz and carbonate cements suggest that the interstitial fluids in the upper part of the stratigraphic column were dominated by waters with lower-than-seawater salinity. $\delta^{13}C$ values of calcite cements (–13.4 to –5.7‰) suggest that organic matter was an important carbon source for calcite cements. It is inferred that meteoric incursion and carboxylic acids generated from organic maturation were responsible for the abundant dissolution events.