DIAGENETIC EVOLUTION OF THE CHERRY VALLEY MEMBER OF THE MARCELLUS SUBGROUP, UNITED STATES

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ABSTRACT

Textural and compositional heterogeneity within the Cherry Valley Member (CVM) of the Oatka Creek Formation (Middle Devonian Marcellus subgroup) reveal a complex diagenetic history of the Appalachian Basin. The CVM generally represents laterally extensive, nodular offshore carbonates composed of pelagic fauna (e.g., goniatites), and it is distinct both lithologically and petrophysically with its bounding mudstones. The highly contrasting interfaces between carbonate and mudstone produce porosity- and permeability-controlled fluid flow that has influenced diagenesis. The CVM is compositionally dominated by carbonates, all of which are diagenetic. The mudstones above and below have mixed matrices of illitic clays and a variable amount of calcite cement and exhibit a divergent diagenetic history from the CVM. Organic material is largely restricted to these mudstones and is characterized as highly dispersed, kerigenous residue that coats matrix components including pore walls hosted within clay crystallites and cements. Improved predictability of diagenetic minerals may lead to better models for reservoir risk assessment.

Qualitative petrographic descriptions and quantitative compositional analyses of core, including thin section petrography and scanning electron microscopy, are combined to describe the textural and compositional framework of the rocks at a range of scales. Compositional analyses are designed to complement petrology and include reflectance spectroscopy (core scale) X-ray diffraction (thin section scale), and energy dispersive X-ray spectroscopy (micron scale). Preliminary compositional results show iron-rich carbonates preferentially crystalize with closer proximity to the Appalachian orogenic front in New York. Additional geochemical testing will include stable isotope analyses of carbonate cements and/or void-fills and carbonate microfossils.

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