

Petrology and Diagenesis of the Bakken Formation, Williston Basin, North Dakota

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The Mississippian-Devonian Bakken Formation (informally the 'Bakken Shale') of the Williston Basin is a significant oil producer with recent oil in place estimates ranging up to 200-400 billion barrels. The formation consists of three informal members; upper and lower organic-rich shale members (sources and seals) and a dolomitic siltstone-sandstone middle member (tight reservoir). The open or closed-fluid nature of the Bakken petroleum system is debated. Petrographic studies have focused primarily on the middle member reservoir, leaving the source and potential seal relatively unstudied. Physical evidence of an open or closed-fluid system should hypothetically exist within these mudstone members.

The author proposes a petrographic diagenetic case-study of all three Bakken members, focusing on mineral paragenesis, porosity origins, and microfracture development. 50 samples from two cores associated with the Nesson-Little Knife Structural Assessment Unit will be analyzed with thinsections, X-ray diffraction, scanning electron microscopy (secondary electron, backscatter electron, energy-dispersive X-ray spectroscopy, and cathodoluminescence), confocal laser scanning microscopy, and pyrolysis. Completed, this study will provide new data to supplement previous petrophysical and petrographic studies, and provide additional insight into the relationships between Bakken Formation diagenesis (paragenesis, porosity and microfracture development), structural regime, and seal, source and reservoir quality.