EXPERIMENTALLY DERIVED GAS AND OIL GENERATION YIELDS AND KINETICS ON SOURCE ROCKS, WILLISTON BASIN

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ABSTRACT

Numerous petroleum systems are now known in the Williston Basin. The bulk rate of kerogen decomposition into hydrocarbons of various source rocks has been investigated and the Bakken, Red River, and Yeoman formations were found to require higher thermal exposures than other marine carbonate source rocks.

A detailed compositional analysis of the gaseous and petroleum products formed from the Red River, Yeoman, Bakken, Upper Lodgepole and Lower Mission Canyon source rocks was undertaken. The yields of oil and gas generated and the rates of decomposition for dry gas, wet gas, light oil and normal oil were determined using laboratory experiments.

While most source rocks generated high amounts of liquid hydrocarbons, the Bakken Formation (Stark County, North Dakota) was found to generate high amounts of gaseous hydrocarbons. This organic rich, supposedly oil prone source rock (hydrogen index of 487) generated over 50% gas (C1-C4) whereas other source rocks generated much lower percentages (<25%). This high rate of gas generation may explain the overpressuring of the Bakken Formation and its relative inability to effectively expel hydrocarbons.

Calculated average generation and expulsion temperatures from high resolution light hydrocarbon analysis of 37 oils from the basin complements the temperatures predicted from source rock decomposition studies.