

# GAS COMPONENT ORIGINS AND PREDOMINANT SECONDARY ALTERATION MECHANISMS - WIND RIVER BASIN, WYOMING

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## ABSTRACT

*The genetic origin of gas resources in the Wind River basin has been a topic of keen interest for many years. Isotopic and molecular analysis of over 100 gas and liquid (i.e., collected from separators) samples collected from Lower Paleozoic to Tertiary reservoirs are included in this study. In addition to evidence for multiple genetic sources, the data indicate a variety of secondary alteration processes alter the original gas composition. Geologic aspects of each petroleum system are addressed in complimentary presentations (e.g., Schelling and Wavrek, 1999 and 2001), whereas this paper focuses on the issues of genetic origin and the processes of secondary alteration.*

*The most important sources of gas in the Wind River basin are part of the Cretaceous and Phosphoria petroleum systems. Additional sources of gas (e.g., within the Tertiary sequences) are known to exist, but these resources have only marginal commercial interest and only form under special circumstances. The gases generated from the Cretaceous petroleum system are quantitatively dominant and display diverse properties due to multiple source horizons (shales vs. coal) and secondary alteration mechanisms. The most important alteration mechanisms are in-situ biodegradation, mixing, and thermochemical sulfate reduction. Gases associated with the Phosphoria petroleum system can originate from in-situ cracking of oil to gas, although it is also possible that some Phosphoria-sourced gas may be generated from localized sources. Phosphoria source rock potential is known to be much lower within the confines of the Wind River basin, as compared to that established in areas further west (e.g., thrust belt region). In addition to the origin of the hydrocarbon fractions, the origin of major non-hydrocarbon (hydrogen sulfide, carbon dioxide) gas constituents will be addressed. The results indicate that a comprehensive petroleum systems evaluation can provide critical insights to be used in exploration risk assessment of gas resources.*

*Schelling, D. D., and D. A. Wavrek, 1999, Structural geology and petroleum systems of the Madden field, Wind River basin, Wyoming: AAPG Convention Abstracts, San Antonio, TX, p. A124.*

*Schelling, D. D., and D. A. Wavrek, 2001, Structural geology and petroleum systems of the northwestern Wind River basin, Wyoming: AAPG Convention Abstracts, Denver, CO, p. A178-A179.*

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