

ENHANCED MICROBIOLOGICAL GENERATION OF COALBED METHANE¹

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Abstract. Vast reserves of coal represent a very large source of energy in the United States. Research has shown that microorganisms are capable of converting coal to methane, though at widely different rates under controlled laboratory conditions. Laboratory experiments have shown that the gas associated with coal can be microbially enhanced from typical values of 60 SCF/ton to as much as 300 SCF/ton. If 1% of the coal in the Powder River Basin could be converted to methane by stimulating existing microorganisms in the coal beds, approximately 30 TCF of gas would be produced, dramatically increasing reserves and profitability. Indeed, much of currently produced coalbed methane (CBM) is of biological origin (e.g., Powder River Basin, WY). The methane is produced by methanogenesis, a process in which microorganisms (methanogens) convert substrates such as acetate or CO₂ and hydrogen into methane. However, the processes leading to methanogenesis in coal are not well understood. This project involves a systematic investigation of different components of methanogenesis to better understand how the process could be enhanced and accelerated. Specifically, we are examining the efficacy of adding nutrients needed by the organisms to the coal and chemical pre-treatment of the coal to release soluble organic matter to stimulate methanogenesis. Additionally, we will characterize and monitor the microbial populations, their response to these manipulations, and the chemical pathways to gain an understanding of the processes, the rate limiting steps and the interactions between microbial communities. An improved understanding of the overall process may ultimately allow optimal stimulation of the conversion of coal to methane.

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