DETERMINING THE SOURCE AND AVAILABILITY OF NUTRIENTS TO MICROBES IN A COALBED METHANE SYSTEM

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Abstract

Despite the importance of coalbed methane (CBM) as a natural gas resource, little is known about the microbial communities responsible for production of biogenic CBM (~20% of all CBM gas). It is thought that the methane producing microbes are limited by nutrients, such as nitrogen or phosphate and trace metals, but it's not clear whether these nutrients are sourced from in-situ biodegradation of the coal or transported in with groundwater recharge. To address this knowledge gap, I will examine the organic content and nutrient and trace metal geochemistry of the solid coal and associated formation water from coalbed methane wells in the Powder River Basin across a hydrologic gradient within single coal seams. Sequential dissolution experiments (chemical extraction of organic and inorganic constituents) of 8 core (coal and sandstone) samples will provide insight into what nutrients are present in coalbeds, what minerals they are associated with, and how they may be mobilized. If significant concentrations of N, P and trace metals are present, in-situ sourcing of nutrients by microbes is highly probable. By sampling 2 coal seam transects I will explore the biogeochemical evolution of coalbed methane systems from the recharge area to depth (at least 530 ft). If microbial-limiting nutrients are transported into coal seams with groundwater recharge, I would expect higher concentrations of nutrients in recharge areas compared to deeper coalbeds. This project will provide crucial understanding of a fundamental aspect of methane production not yet fully understood.

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