A Shift in Methanogenic Pathways Caused by the Treatment of Powder River Basin Subbituminous Coal by Hydrogen Peroxide

ZAIXING HUANG[1] AND MICHAEL URYNOWICZ[2]

[1]1000 E University Ave. Dept 3295, University of Wyoming, Laramie, WY USA
zhuang@uwyo.edu

[2]1000 E University Ave. Dept 3295, University of Wyoming, Laramie, WY USA
murynowi@uwyo.edu

Coalbed methane represents a potential source of renewable natural gas. Significant efforts have been taken to enhance the conversion of coal to methane biogenically in recent decades. Nevertheless, the availability of the coal as a substrate or food source for the microorganisms remains an important limiting factor. Several technologies have been developed at the University of Wyoming's Center for Biogenic Natural Gas Research to enhance the converison of coal to methane by indiginous microorganisms. Oxidants such as hydrogen peroxide have been shown to be promising treatment agent that allow for the depolymeriization and solubilization of a fraction of coal and many of the soluble coal-derived compounds have been shown to be readily bioavailable. Interestingly, a shift of methanogenic pathways was observed following treatment of the coal with hydrogen peroxide. Studies have shown that much of the newly formed methane in the Powder River Basin was formed through acetoclastic methanogenisis. The methanogens in the original coal inoculum were also found to be dominated by acetoclasts. Nevertherles, evidence from stable isotope analyses and microbial assay suggest that following the treatment of the coal with hydrogen peroxide the methane was produced through hydrogenotrophic methanogens. The results implies that biogenic coalbed methane production might be enhanced through the manipulation of the subsurface environment in order to alter the methanogenic pathways.