Some anaerobic microbial communities in peat bogs and the influence on the biogas formation

S. P. YAO, J. CHEN, H. DING AND K. ZHANG

Department of Earth Sciences, Nanjing University, Nanjing, China (spyao@nju.edu.cn)

Microorganisms play important roles in the transformation of peaty organic matter. The interplay between organic matter transformation and microbial activities is complex in the peat environment and the underlying mechanisms or pathways for carbon cycling may vary from case to case. The goal of this study was to investigate distribution of anaerobic microbial communities under varying geological or chemical conditions in different peat environments, and search for patterns of microbial organic carbon transformation under varying organic matter types conditions by simulate experiment. Samples were collected from mangrove bog (modern to 10,000 years) in Hainan province and from burial peat (Holocene) in Yunnan province of China. Content of total organic matter ranged from 27.6% to 55.7%.

There are four kinds of main advantage germ clusters in the peat bogs including fermentation bacteria, anaerobic cellulose-degrading bacteria, sulfate-reducing bacteria and methane-producing bacteria. Fermentative bacteria (10^4 to 10^6 cells/g) based on MPN were significantly higher than sulfate-reducing bacteria or acetogens (< 10^3 cells/g) in all peat samples. The distribution or number of fermentative bacteria to some extent correlated positively with the organic matter content (e.g., humic acids) in some but not all samples, suggesting that organic matter content may not be the only factor controlling the population of fermentative bacteria. We focused on fermentative bacteria because they play a critical role in transforming cellulose organic matter to smaller organic molecules bio-available to other dissimilatory microorganisms such as sulfate-reducing bacteria or methanogens.

On the other hand, fermentative bacteria create anaerobic environment, which removes oxygen and enriches hydrogen in the organic matrix. By concentrating and purifying the advantaged species of the fermentation bacteria, we culture the advantaged germ in different matrix. Highly nutritious peat environment could be simulated and then the bacterial-degradation experiments of plant may be controlled well. The experiment has already carried on for 6 months, The degrader of Fermentation bacteria causes that organic matter from the plant lost a great deal of oxygen, and cause the matrix enrich more hydrogen. we can also know that the production rate of bacteria-degrading biogas is 5-10 times larger than the production rate of hydrolysis gas without bacteria. Thus fermentative process may help enhance the quality of organic carbon preserved as fossil fuel in geological formation.

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Extreme fractionation of low salinity magmatic fluids

BRUCE YARDLEY[1], DAVID BANKS[1] AND VICTORIA VRY[1,2]

[1]School of Earth and Environment, University of Leeds, LS2 9JT, UK

[2]now at: Dept. of Earth Science and Engineering, Imperial College London, SW7 2AZ

Most crustal magmatic fluids are predominantly chloride solutions, but in certain situations, notably in some granite pegmatites, water-rich fluids occur which have low salt contents (<seawater salinity). The consequences of low salinity include higher gas solubilities, resulting in potentially higher bicarbonate levels, and low concentrations of Ca, permitting higher concentrations of additional ligands such as fluoride and phosphate. LA-ICP-MS analysis provides a means of determining many of the significant pegmatite components in single inclusions, and has been carried out in Leeds using a Geolas Q laser ablation system (193nm ArF Excimer laser) coupled to an Agilent 7500c ICP-MS. Calibration is with glass SRMs and with solutions loaded in capillaries.

Fluid inclusions from the quartz core of the Muiane Li-pegmatite, Mozambique (sampled by O. Von Knorring), are 3 phase at room temperature, with CO_2 liquid and vapor. Large inclusions (25-60 μm) are common. LA-ICP-MS analysis of individual inclusions reveals significant variations within texturally similar settings, and in particular Na/K (wt) ranges from <1 to >15. Extreme enrichment in Cs (to >2000 ppm) and Li (to c.3000 ppm) is associated with high Na/K ratios and possibly arose as K-feldspar and micas were precipitated. Such fluids are also enriched in B (to c.3000ppm). Not surprisingly, spodumene is a major mineral in the deposit and pollucite has been reported.Some high Na/K fluids are very rich in As (>25000ppm), while others contain only a few thousand ppm As. A solid As daughter phase has been observed in a few very large inclusions.

The results are taken to indicate that in the final stages of magmatic fluid evolution, extreme fractionation effects can be produced, reflecting the growth of new solid phases. However vapour-liquid separation may play an important role in the development of the decoupled As-enrichment.