Thermogravimetric analysis of organic matter bound to clay minerals with sequential pretreatments

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Clay extraction, sequential treatments (organic solvent extraction, base and acid hydrolysis) and thermogravimetric analyses were used to move forward understanding thermal stability of organic matter (OM) bound to clay minerals with different binding mechanisms in muddy rocks from Jiyang sag, Shengli oil field, East China.

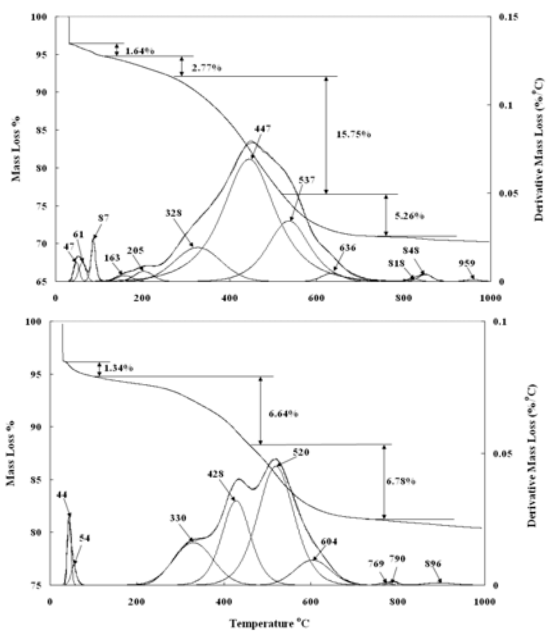

Figure 1: TGA results for organo-clay complexes (upper) and residues after sequential treatments (lower).

A series of large mass losses is observed at 163, 205, 328, 447 and 537°C attributing to organic matter (Fig 1). There is a mass loss of 2.77% for the first two peaks, and they disappeared after sequential treatments (Fig 1). This is strong evidence that the free and bound OM is pyrolyzed in relatively low temperature, while the tightly bound OM is particularly stable until temperature increases to 300-550°C. They correspond well to S1 and S2 measured by Rock Eval pyrolysis, respectively. These results have significant implications for global C cycling and hydrocarbon generation.

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Diversity of Fe(III)-reducing prokaryotes in acidic coal mining lake sediments

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While Fe(III) exists predominantly in the solid phase as oxyhydroxide minerals at circumneutral pH, Fe(III) is more soluble under acidic conditions. It is believed that the microorganisms and mechanisms involved in the microbial reduction of Fe(III) under acidic and pH neutral conditions are dissimilar. Since most cultivated Fe(III)-reducing prokaryotes are neutrophilic, we have only a marginal understanding of the microorganisms that drive the reduction of Fe(III) in acidic habitats. Thus, the objectives of this study were to (i) explore the microbial diversity of iron-rich acidic coal mining lake sediments, (ii) elucidate the Fe(III)-reducing microbial community, and (iii) obtain novel key isolates.

Acidic (pH 2.8; zone I) and slightly acidic (pH 5.3; zone IV) sediment were used for phylogenetic analysis and for enrichment and isolation of acidophilic or acido-tolerant Fe(III) reducers. Both sediment zones showed Fe(III)-reducing activity. PCR products specific for species related to

Acidiphilium were obtained in Zone I only while *Geobacter*-related sequences could be detected in both zones. The 16S rRNA gene libraries of zone I and IV shared low similarity. Zone I was dominated by *Actinobacteria* (45%), *Alphaproteobacteria* (13.2%) and *Gammaproteobacteria* (10.5%), while zone IV was dominated by *Acidobacteria* (35%), *Deltaproteobacteria* (15%) and Candidate division OP3 (10%). *Acidobacteria*, *Gammaproteobacteria* and *Firmicutes* were found in both zones suggesting that those taxa can cope with both acidic and slightly acidic conditions. Overlay-solid media were used to isolate various acidophiles or acido-tolerant potential Fe(III) reducers. These isolates will be tested for their Fe(III)-reducing capabilities. Considering that *Acidobacterium*- like isolates growing in liquid cultures were reported to be able to reduce Fe(III) at low pH [1,2], it is suggested that Acidobacteria–like species might be key players involved in Fe (III) reduction in this acidic coal mining lake.

[1] Coupland & Johnson (2008) *FEMS Microbial Lett.* **279**, 30-35. [2] Blöthe *et al*. (2008) *Appl. Environ. Microbiol.* **74**, 1019-1029.