Evaluation of different RNA preservation methods to study the active microbial communities in oil sand tailings ponds

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Analysis of RNA is the best approach to understand active microbial populations in an environment. In contrast to DNA, which can persist in soil for several days, RNA is an unstable macromolecule making it more suitable to investigate metabolically active microbial communities. Due to its susceptibility to degradation, the preservation of a sample containing RNA is an important step in molecular studies. In the field of Oil Sand Tailings Research sample-preservation is especially important as due to logistical limitations the extraction of nucleic acids may only be possible days after the samples are taken. The aim of this study is to evaluate the ability of different methods to preserve RNA in Oil Sand Tailings samples both short term (5 days) and long-term (30 days). In our study different preservation solutions including LifeGuard™ Soil Preservation Solution (MoBio Laboratories, Inc.), RNAlater® (Ambion), glycerol and liquid nitrogen are compared to find the best preservative method for soil RNA preservation.

Analysis of different RNA samples shows that all four preservation methods provide significant amounts of RNA for further analysis. After cDNA synthesis T-RFLP analysis is used to compare community structure derived from the differently treated samples. Additionally, during RNA-extraction co-precipitated DNA is also analysed. The community structure data derived from cDNA and DNA provides information on the ability and comparability of the different techniques to preserve microbial communities and demonstrates the importance of RNA (cDNA) in microbial ecology.

Interaction of Eu(III) with calcium carbonate: Spectroscopic characterization

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The present work investigated irreversible sorption processes in the Eu-CO_2-NaCl-$CaCO_3$ system, by combining macroscopic with TRLFS and RBS spectroscopic studies.

Powders and single crystals were used due to spectroscopic tools requirements. Sorption of europium was investigated by varying the initial concentration in europium concomitant with the contact time (few hours up to 6 months). TRLFS identified two lifetimes and therefore two species at the calcite/water interface. Lifetimes allow an unambigous discrimination between sorption processes and incorporation. Values of the lifetimes are comparable to the literature [1] and the total loss of water molecules is a distinctive sign of Eu(III) species incorporation .

RBS confirmed that Eu(III) is associated in two different states with calcite:

(1) heterogeneous (supported by SEM) surface accumulation, i.e. as a surface precipitate, after 1 month contact time
(2) incorporation up to depths greater than 160 nm after 1 month.

[1] Fernandes, M. M. *et al*., *J. Colloid Interface Sci*. **321** (2008) 323-331

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