Biogeochemical characterization of Mercury (Hg)-contaminated sediments at the Bunikasih Gold mine, West Java Province, Indonesia

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The objective of this study was to investigate the biogeochemical characteristics of mercury (Hg)-contaminated sediments at the Bunikasih Gold Mine, West Java Province, Indonesia in order to provide a basic and initial description of biogeochemically sediments at this contaminated site for bioremediation purposes. Sediments contained elevated total Hg concentrations of 28 – 61 ppm. XRD analysis revealed the presence of quartz and berlinite minerals, indicating that mercury contained in sediments was not in mineral form of mercury but in other form. SEM-EDS analysis indicated the presence of Si (30 – 44%), Al (0.6 – 8%), O (45 – 51%), and C (3.5 – 7%). Ten heterotrophic bacteria that were resistant to $HgCl_2$ (25 ~ 550 ppm) were isolated from the Hg-contaminated sediments. 16S rRNA gene sequence analysis identified the bacteria as strains of *Pseudomonas koreensis*, *Pseudomonas putida*, *Pseudomonas fulva, Stenotrophomonas maltophilia* and *Aeromonas sobria*.

The findings of this study provide evidence of heterotrophic bacteria associated with Hg-contaminated sediments as well as provide the first information of phylogenetically-diverse Hg-resistant bacteria in the Hg-polluted sites of Indonesia. Such information may prove highly useful for developing in situ bioremediation of Hg-contaminated sites in Indonesia.

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Interactions of Eu(III) and Cm(III) with celestite and strontianite: Precipitation kinetics and uptake mechanisms characterisation

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The present work focuses on the characterization of lanthanides and actinides interactions with celestite ($SrSO_4$) and strontianite ($SrCO_3$). Precipitation kinetics studies of the minerals were performed in batch type and mixed-flow reactors experiments, in presence and absence of Eu(III) and Cm(III) in solution. It is shown that the presence of Eu(III) and Cm(III) as trace elements (up to 4.5×10^{-4} mol L^{-1}) have no effect on the precipitation rates, which are dependant on the initial saturation index.

TRLFS analyses shown a clear incorporation of the Eu(III) and Cm(III) into the mineral structures, with a minor surface component for the strontium sulfate. Similar studies were earlier performed on aragonite, calcite ($CaCO_3$) and gypsum ($CaSO_4$) in the same experimental conditions. Incorporation was observed for aragonite and only surface complexation for the calcium sulfate, while both mechanisms were observed for calcite. Therefore, the ligand strength was expected to play an important role in the uptake mechanisms. The present work focused on two minerals isostructural with aragonite, demonstrating the importance of the lattice parameters in the uptake mechanisms as well. Moreover, the presence of Eu(III) and Cm(III) as incorporated species has no effect on these lattice parameters.

The Eu(III) and Cm(III) affinity coefficients for the $SrSO_4$ and $SrCO_3$ structure as well as the strontianite and celestite precipitation rates as a function of the oversaturation (SI) were determined. This information is prerequisite to develop a reactive transport model able to predict the behavior of these elements in a porous media under chemical perturbation.