

Temporal variations in ^{13}C and ^{14}C in particulate organic matter in the Kuji River water

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Introduction

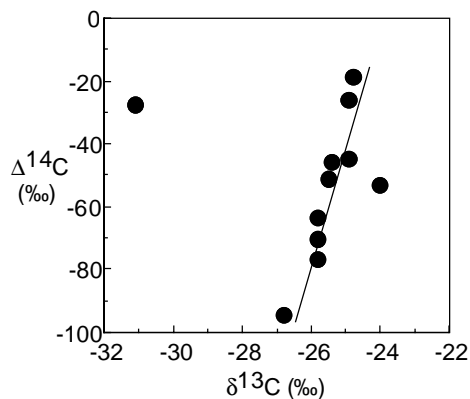
Particulate organic matter (POM) in river water is one of carbon materials transported from soil to ocean. The study on the behavior and source of POM is important to understand modern carbon cycle. In this study, we present data related to variations of stable and radioactive carbon ratios of temporal series of suspended particulate organic matter (POM) from the Kuji River in Japan.

Experimental

Field experiments were conducted 10 times at a station of the downstream Kuji River from May 22 to October 18 in 2001. Approximately 100 l of the river waters were collected by a handy pump. The water samples were dewatered by use of a single-bowl continuous-flow centrifuge. Radiocarbon and $\delta^{13}\text{C}$ analyses were performed at the AMS facility of the JAERI-MEL.

Results and discussion

Figure shows the $\Delta^{14}\text{C}$ of POM as a function of $\delta^{13}\text{C}$ values. There is a good correlation between $\delta^{13}\text{C}$ and $\Delta^{14}\text{C}$ values of the POM except for the sample collected at the early of July. The correlation factor is 0.92. This result indicates that the $\delta^{13}\text{C}$ and $\Delta^{14}\text{C}$ values of POM reflect the variations of river and watershed environments.



Microbially induced dissolution of cobalt(III) oxyhydroxide under the oxic-anoxic fluctuation in subsurface environment

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Objectives

To understand the migration behavior of ^{60}Co through the microbially mediated redox reactions in subsurface environment, where the oxic-anoxic fluctuation seasonally occurs due to the infiltration of oxygen-containing rain water from the surface, we examined the role of microbial activities by sulfate-reducing bacteria (SRB) in the dissolution of cobalt(III) oxyhydroxide, i.e., $\text{CoO}(\text{OH})$, which has very low solubility.

Results and Discussion

Adding of SRB cultured medium to the $\text{CoO}(\text{OH})$ suspension, the Co concentration in the solution was increased with incubating of time (Figure 1). This result shows $\text{CoO}(\text{OH})$ was dissolved by hydrogen sulfide produced by SRB, and/or by microbial enzymatic reaction. After 60 hours, the insoluble precipitate was produced and SEM-EDS analysis indicated the precipitate was the cobalt sulfide (CoS_x).

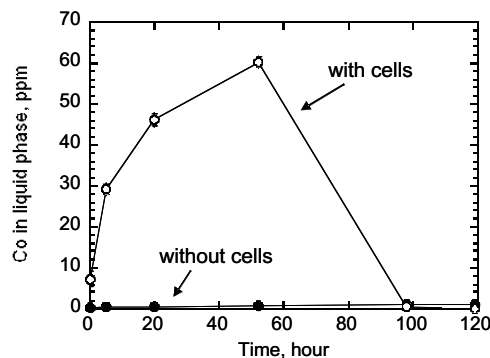


Figure 1 Reductive transformation of $\text{CoO}(\text{OH})$ by SRB and precipitation of cobalt sulfide.

After the microbial transformation from $\text{CoO}(\text{OH})$ to CoS_x , the CoS_x precipitates suspensions were exposed to the atmosphere supposed oxic condition by the infiltration of rain water. Finally, insoluble CoS_x oxidatively dissolved into soluble Co^{2+} ion.

These results suggest the insoluble $\text{CoO}(\text{OH})$ may dissolve through microbially mediated reduction and oxidation by the oxic-anoxic fluctuation in unsaturated subsurface and this would be helpful to understand the microbial impact on radionuclide migration.