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アンチモン微生物変換と環境動態における影響
Microbiological transformation of antimony and its geochemical implications

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Antimony (Sb) is a naturally occurring toxic element and is considered to be a priority pollutant of interest by the USEPA. Although the concentrations of Sb in soils are generally low ($<$1 mg kg^{-1}), elevated levels of Sb have been released via mining activities and other anthropogenic activities due to its increasing industrial use. Antimony is commonly associated with arsenic (As) in the environment and both elements have similar chemistry and toxicity. Increasing numbers of studies have focused on microbial roles in As transformations, while microbial-Sb interactions are still not well understood. To gain insight into microbial roles in the geochemical cycling of Sb, soils from an old stibnite (Sb_2S_3) mine tailing area (Ichinokawa mine, Ehime, Japan) were characterized geochemically and examined for the presence of Sb-transforming microbial populations. Total concentrations of Sb and As were higher in the surface soil (0-3 cm: 2280 and 1240 mg kg^{-1}, respectively) and decreased with depth (9-12 cm: 330 and 133 mg kg^{-1}). Bacterial community profiles, examined by cultivation-independent analysis using 16S rRNA gene-based denaturing gradient gel electrophoresis, did not show substantial differences through depth (0-12 cm). After the aerobic enrichment culturing with Sb(III) (100 μM), pure cultures of *Pseudomonas*- and *Stenotrophomonas*-related isolates with Sb(III) oxidation activities were obtained. Anaerobic enrichment cultures capable of reducing Sb(V) (2 mM) were also obtained, in which the precipitation of antimonite [Sb(III)] as antimony trioxide was observed. These results demonstrate that indigenous microorganisms associated with stibnite mine soils are capable of Sb redox transformations and contribute to the speciation and mobility of Sb *in situ*.

キーワード: アンチモン, ヒ素, アンチモン還元微生物, アンチモン酸化微生物, 土壌微生物群集
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