Arsenic behavior with macrobial activity in deepsea sediment

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Arsenic behavior in between the deep seafloor sediment and porewater, taken from Nankai Trough by IODP Exp. 338 down to 2000 m depth from the seafloor, was studied to document the concentration process of this element in marine sedimentary rocks.

Arsenic concentration of the sediments varies within 3 and 13 ppm without any relationship to the depth and lithology. In porewater, the arsenic concentration varies within 10 and 220 ppb, and has two peaks at 140-160 mbsf (meters below seafloor) (200 ppb) and 400 mbsf (220 ppb). The former peak is consistent with the peak maximum of bromide concentration of porewater. Ammonium and phosphate concentrations of porewater increases from the seafloor and is highest at this depth, while total amino acid concentration of the sediment decreases with depth negatively corresponding to those components. Thus, the arsenic would be released via microbial decomposition of algae and other organic matters. The arsenic concentration again increases down to about 400 mbsf, where the highest concentration of methane hydrate was observed and autotrophic microbial activity would occur, and it decreases <30 ppb below 500 mbsf. These results indicate that microbial activity plays an important role to release arsenic from sediments into porewater during the early stage of diagenesis in deepsea sediments until finally fixed as mineral phase(s) in the sediments.

The observed process here suggests the importance of biological activities to concentrate and release arsenic in aqueous systems including subsurface envrionment.