

Relationship between arsenic dissolution mechanism to organic matters in the marine sediments from Kumano Basin

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Arsenic is believed to be accumulated in marine sedimentary rocks. In this study, porewater and squeezed cakes were analyzed to trace arsenic concentration with depth and proceeding the diagenetic reaction including maturation of organic matters. Samples for this study were collected at Site C0002 (upper Kumano Basin), C0021 and C0022 (accretionary prism) during IODP Exp.315 and Exp.338.

The analytical result of porewater at the Site C0002 (0-1000 mbsf) (mbsf=meters below seafloor) showed that the arsenic concentration was between 0-15 ppb at 0-100 mbsf, then increased to reach the highest concentration (400 ppb) at 200 mbsf. Below that depth, it was constant about 100 ppb and increased again to 200 ppb from 300-400 mbsf, then decreased to 600 mbsf <30 ppb below that depth. Arsenic concentration of sediments was 5-13 ppm, and the most of samples contained >10 ppm especially at 300-400 mbsf.

At the Site C0021, arsenic concentration of porewater was 10 ppb on the average at 0-160 mbsf and had no relationship to the depth, and the highest concentration was recorded at 200 mbsf (100 ppb). Arsenic concentration of sediments was 5-10 ppm down to 150 mbsf, and peaked at 400 mbsf (23 ppm).

At the Site C0022, arsenic average concentration was 10 ppb between 0-120 mbsf. The highest concentration was observed at 120-150 mbsf (100 ppb), and then drastically decreased to 200 mbsf (20 ppb), then it became constant below that depth. Arsenic concentrations of sediments largely varied between 3-12 ppm.

The arsenic concentration of porewater was higher than that of sea water (1.7 ppb) and varied with depth, suggesting that arsenic fixed in the sediments would be released into the porewater along with changing physico-chemical conditions.

At the Site C0002, the arsenic concentration of porewater is the higher when the pH is 8.3. As/Cl (to take dilution of sea water into account) and pH have positive relationship. It is known that dissolution of iron hydroxide adsorbed arsenic or desorption associated with reduction of arsenate (As^V) to arsenite (As^{III}) occur following the reduction. The similar reaction might occur at this site. In contrast, such a relationship was not observed at the Site C0021 and C0022.

T_{max} value, which is the temperature indicating the complete decomposition of organic matters and can be used for the index of maturation degree, was measured by Rock Eval pyrolysis for the sediments of the Site C0002 (200-500 mbsf). The arsenic concentration of porewater was high with increasing T_{max} (425-430 °C). On proceeding diagenetic reaction, arsenic adsorbed to or fixed in organic matters would be released into the porewater. The similar relationship was observed at Site C0021, but C0022. Maturation stage of sedimentary organic matters would affect to the arsenic dissolution.

Keywords: arsenic, Kumano Basin, IODP