

Sedimentation of iron deposits in Nagahama Bay, Satsuma Iwo-jima Island: Precipitation behavior of colloid

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Satsuma Iwo-Jima Island, with volcanic activities, is located about 40km south of Kyushu Island, Japan. This island is one of the best places to observe a shallow water hydrothermal system. Nagahama Bay, in the south of Satsuma Iwo-Jima Island, is partly separated from open sea. The seawater appears dark reddish brown color due to colloidal iron hydroxide by the mixing of volcanic fluids (pH=5.5, 50-60 degree Celsius) and oceanic water (Ninomiya & Kiyokawa, 2009; Kiyokawa et al., 2012; Ueshiba & Kiyokawa, 2012). Very high deposition rate (33 cm per year) of iron-rich sediments was observed in the bay (Kiyokawa et al., 2012). However, precipitation behavior of colloidal iron hydroxide has not been clarified. In this study, I report the results of analysis of deposition experiments of the colloidal particles at the Nagahama bay.

Since the size of the colloidal particles is 1nm~1 μ m, single particle cannot be precipitated. This arise from precipitation of the particles in the viscous fluid is according to the Stokes' law. Colloidal iron hydroxide has the property of having the electric charges on the surface. The charge on the colloids is affected by pH of its surrounding seawater and can become more positively or negatively charged due to the gain or loss, respectively, of protons (H⁺) in the seawater. This property affects the stability of the colloidal dispersion.

FE-SEM observation shows that the suspended particles consist of colloidal iron hydroxide (about 0.2 μ m), on the other hand, the iron-rich sediments are composed of bigger one (>1 μ m). This indicates the colloidal iron hydroxide is precipitated by flocculation. We examined the precipitation amount of colloidal iron hydroxide under the various pH environments. The precipitation amount of pH=7.8 seawater 10% higher than that of pH=7.2. This result is roughly follows the theoretical value.

Keywords: Kikai Caldera, Colloid, iron hydroxide