**Removal of cadmium ion in water using sludge from drinking water treatment plant**
**（浄水場から排出されるスラッジを利用した水中のカドミウムイオンの除去）**

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The purpose of this study was to investigate the adsorbing ability and the mechanism of sludge from Miyamachi and Nishino drinking water treatment plants in Sapporo city to remove cadmium ion ($Cd^{2+}$) from water. The sludge were dried at 100℃ for 24 hours, cooled at room temperature, crushed into powder form and then sifted out with 1 mm of a sieve. Characterization of sludge was done using Elemental analysis, ICP-MS, SEM/EDS and BET. AAS was employed for analysis of cadmium in the solution. The sludge without treatment, washed with distilled water or acid solution and combined with alginate or silica gel were used in this study. The effects of the parameters such as a shaking time, the concentration of cadmium ion in solution, amount of adsorbent and pH on adsorption were investigated. To determine the component of sludge taking part in the adsorption, several kinds of artificial sludge were prepared using aluminium sulphate, kaolin, iron and manganese ion.

The main components of sludge were aluminium, silica and iron as a result of the addition of poly aluminum chloride (PAC), a main coagulant of drinking water treatment plants. Based on another elemental analysis, the amount of C, H, O, N, S, ash was 8.8, 3.0, 26.3, 0.5, 0.5, 61.4% for sludge of Miyamachi and 42.4, 2.4, 19.8, 0.3, 0.3, 35.1% for sludge of Nishino. The high amount of carbon in Nishino sludge was due to the addition of activated carbon in the treatment process. The surface area of sludge of Miyamachi and Nishino obtained from BET instrument was 29 and 413 $m^2g^{-1}$, respectively. The concentration of cadmium in the both sludge were less than the detection limit of ICP-MS.

The adsorption capacity of sludge with $Cd^{2+}$ was stable from 1 to 24 hours of shaking time, therefore 2 hours was considered as the shaking time. For 50 ml of cadmium solution, the favorable mass of sludge was 1 g, where adsorption capacity of Miyamachi and Nishino were 86% and 88%, respectively. The ideal pH of solution was 4 to 8 and then precipitation occurred at the higher pH than 8. The adsorption capacity of the sludge from Miyamachi and Nishino increased more than 90% by washing with distilled water and 0.01 M EDTA. However, the ability of sludge was decreased gradually with increasing EDTA's concentration. Based on data of artificial sludge, it was suggested that iron ion and humic acid in the sludge were the important component in the process of adsorption. Using the Langmuir isotherm model, the maximum adsorption capacity was 2.94 mg/g of sludge from Miyamachi and 3.24 mg/g from Nishino, respectively. As conclusion, both of sludge from drinking water treatment plant could be considered as a low cost adsorbent to remove cadmium ion in water.