

Poster Presentation

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Structure and Anion Exchangeability of Ni-Al-Type Layered Double Hydroxides

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Layered double hydroxide (LDH) is one of promising inorganic materials for cleaning the environmental water polluted by toxic anions. The crystal structure of LDH is composed of the positively-charged metal hydroxide nanosheets and the anions with water molecules intercalated between the nanosheet layers. To put LDHs for practical use, it is necessary to understand why only special anions can be intercalated into the crystal structure from the aqueous solution. In this study, the anion exchange experiments and the synchrotron radiation x-ray powder diffraction measurements of Ni-Al-type LDHs of several kinds of Ni/Al ratios with chlorine and nitrate anions were performed to investigate the relationship between the anion exchange selectivity and crystal structures. The nitrate ion selectivity is normally poor in most of LDHs with different metal ions in the hydroxide nanosheet [1]. However, the nitrate ions were preferred to the chlorine ions in Ni-Al-type LDH when Ni/Al = 4, whereas the chlorine ions were selected when Ni/Al = 2. The crystal structure analysis revealed that the interlayer distance decreased and the thermal motion of the nitrate ions suppressed in Ni-Al-nitrate-type LDH with increasing the Ni/Al ratio, whereas those of the chlorine ions in Ni-Al-chlorine-type LDH increased and enhanced with increasing the Ni/Al ratio. These results indicate that the nitrate ions are more stable than the chlorine ions in the crystal structure of the Ni-Al-type LDH when the positive charge of the nanosheet is small, i.e. the number of anions is small. The short interlayer distance and the small thermal vibration of anions in the crystal structure are the key to understand the anion selectivity of LDH.

[1] S. Miyata, *Clay. Clay Miner.*, 1983, 31, 305-311.

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