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Confinement and Storage of Cyanate in the Nano Scale via Nanolayered Structures

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Abstract : Cyanate is one such anion which is produced during protein poisoning in the body and has been studied extensively in the field of biochemistry because of its toxicity. The present work aims at confinement and storage of cyanate in the nano scale. It was achieved through the intercalation of cyanate anions into nanolayerd structures of Ni-Al LDH. In addition, the effect of aging time on the intercalation of cyanate was clarified using X-ray diffraction and scanning electron microscopy. Furthermore, the effect of cations on the affinity towards the intercalation of cyanate anions inside LDH structure was studied by replacement of tetra-valent cations Ti4+ instead of the tri-vallent cations Al3+ during the preparation of LDH structure. X-ray diffraction patterns of the Ni-Ti LDH showed that the interlayer spacing was 0.73 nm. This spacing was smaller than that of Ni-Al LDH suggesting that the interlayered anions into Ni-Ti LDH are different from those into Ni-Al LDH. Thermal analyses (TG, DTG, and DTA) and Infra-red spectra revealed the presence of only cyanate anions into Ni-Ti LDH while, in the case of Ni-Al LDH, both cyanate and carbonate anions were observed. SEM images showed plate-like morphology for both Ni-Ti and Ni-Al LDHs although the shapes of their plates are not similar. Our results suggested that the LDH structures containing titanium cations have higher affinity for cyanate anions than those containing aluminum cations. Therefore, this choice for cyanate in the interlayered spacing widens the applicability to study the effect of the confinement on the toxicity of cyanate by bio researchers.

Keywords : nanolayered structures, Ni-Al LDH, Ni-Ti LDH, intercalation of cyanate anions, urea hydrolysis
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