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X-RAY POWDER DIFFRACTION/INFRARED SPECTROSCOPY

SUPARA TOKUNALAI: INTERCALATION IN SOME CLAY MINERALS.

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Intercalation of organic and inorganic materials into halloysite, obtained from Te Puke and Kauri mountain in New Zealand and a kaolinite from Thailand, has been investigated by FTIR spectroscopy and X-ray diffraction techniques. In this study, the intercalated complexes were prepared by soaking the clays in each liquid guest material at room temperature.

Potassium acetate could be directly intercalated into both dehydrated halloysite and kaolinite whereas ethylene glycol were intercalated only by displacing potassium acetate from the clay-potassium acetate intercalates. By contrast poly(ethylene glycol) of molecular weights 200, 300, 400 and 600 could penetrate only into the interlamellar space of hydrated halloysite. Moreover, potassium acetate and ethylene glycol molecules were partially released from the interlayer space upon heating at 50°C overnight. When intercalation occurs the FTIR spectrum is modified by perturbation of the structural hydroxyl vibration mode and by formation of hydrogen bonds between the intercalated material and the internal surface of the clay.

X-ray diffraction studies showed that oxyethylene unit of poly(ethylene glycol) was intercalated as a monomolecular layer arrangement, such that the interlayer expansion were 2.92-3.98 Å. The keying of oxygen atom into hexagonal hole in the tetrahedral sheet of halloysite is postulated. Elemental analyses have led to an estimated formula of $\text{Al}_4\text{Si}_4\text{O}_{10}(\text{OH})_8(-\text{OCH}_2\text{CH}_2-)_2$ for Te Puke-PEG300 complex.

In this study, halloysites of different morphologies exhibited similar behavior towards intercalation.