New Techniques for Studying the Intercalation of Kaolinites from Georgia with Formamide

Ray L. Frost, Daniel A. Lack, Gina N. Paroz and Ha T. Tran Thu

Centre for Instrumental and Developmental Chemistry, Queensland University of Technology, 2 George Street, GPO Box 2434, Brisbane Queensland 4001, Australia

Abstract: A new technique utilizing Raman microscopy and Fourier transform infrared (FTIR) microscopy is described. This technique uses thin films of oriented clay aggregates on glass slides suitable also for X-ray diffraction (XRD). Raman microscopy proved the most useful technique providing both better resolution of the OH-stretching bands and greater spectral resolution. Kaolinites from Washington County, Georgia, with varying defect structures involving layer stacking were intercalated with formamide and additional Raman bands were observed at 3610 and 3627 cm^{-1}. A concomitant decrease in the inner-surface OH band intensities at 3695 and 3685 cm^{-1} occurred. These bands are attributed to the inner-surface OH hydrogen bonded to the formamide molecule through the C=O group. The 3627 cm^{-1} band is sharp with a half width of 7.5 cm^{-1} and comprises 11% of the total normalized band area. When two additional OH bands are observed at 3610 and 3627 cm^{-1}, two C=O bands at 1674 and 1658 cm^{-1} are observed also. The two additional Raman inner-surface OH bands were not observed in the IR spectra. However, a band of low intensity was observed at 3590 cm^{-1}. Models for the intercalation of formamide in kaolinites are proposed.

Key Words: Formamide • Hydroxyls • Infrared Microscopy • Intercalation • Kaolinite • Raman Microprobe • X-ray Diffraction

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