
Preparation of a Kaolinite-Polyacrylamide Intercalation Compound

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Abstract: Acrylamide has been polymerized between the layers of kaolinite by heat treatment. Acrylamide monomer was first intercalated by the displacement reaction between a kaolinite-N-methylformamide (NMF) intercalation compound and a 10% acrylamide aqueous solution. The resulting intercalation compound showed a basal spacing of 11.3 Å. Infrared (IR) spectroscopy and ^{13}C nuclear magnetic resonance spectroscopy with cross polarization and magic angle spinning (^{13}C CP/MAS-NMR) indicated the replacement of NMF by acrylamide. IR spectroscopy also showed the formation of hydrogen bonds with the hydroxyls of kaolinite. When the kaolinite-acrylamide intercalation compound was heated at 300°C for 1 hr, the basal spacing increased to 11.4 Å, and IR and ^{13}C CP/MAS-NMR showed the disappearance of C=C bonds, indicating the polymerization of acrylamide. The heat-treated kaolinite-acrylamide intercalation compound was resistant to 30 min-washing with water, whereas the untreated kaolinite-acrylamide intercalation compound collapsed after the same treatment, an observation consistent with acrylamide polymerization between the layers of kaolinite. IR spectroscopy revealed that polyacrylamide was hydrogen bonded to kaolinite, but in a manner different from the hydrogen bonding of acrylamide.

Key Words: Acrylamide • Infrared spectroscopy • Intercalation • Kaolinite • Nuclear magnetic resonance • Polymerization • Thermal treatment

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