
Reactions of Thiophene and Methylthiophenes in the Interlayer of Transition-Metal Ion-Exchanged Montmorillonite Studied by Resonance Raman Spectroscopy

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Abstract: The adsorption and reaction of thiophene and methylthiophenes in the interlayer of Cu²⁺- and Fe³⁺-montmorillonites were investigated by resonance Raman spectroscopy. Thiophene and 3-methyl-thiophene polymerized to form cations of polythiophene and polymethylthiophene respectively, which were characterized by absorption bands in the near-infrared region. These polymer cations formed in the interlayer were reduced to their neutral polymers if the clay-polymer complexes were in contact with water, and the formation of their neutral polymers was clearly demonstrated by their resonance Raman spectra. 2,5-Dimethylthiophene in which polymerization was hindered by methyl substitution at the 2 and 5 positions, was oxidized to 2,5-dimethylthiophene cation in the interlayer.

Key Words: Adsorption • Interlayer reaction • Montmorillonite • Polymerization • Raman spectroscopy • Thiophene

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