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# Acidic Properties of Montmorillonite in Selected Solvents

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**Abstract:** Montmorillonites saturated with  $\text{Al}^{3+}$ ,  $\text{H}^+\text{-Al}^{3+}$ , and  $\text{K}^+$  were titrated in  $\text{H}_2\text{O}$ , acetonitrile (AN), and dimethylformamide (DMF) to investigate the acidic properties of the clay in these solvents and to evaluate the application of nonaqueous titration procedures for studies of the acidic properties of 2:1 swelling clays. Samples were titrated with tetramethylammonium hydroxide using a combination glass electrode for potentiometric determination. Titrations of base required to reach the final potentiometric endpoints were greater in AN than in DMF and  $\text{H}_2\text{O}$ . The larger titers in AN compared to  $\text{H}_2\text{O}$  were attributed to pH-dependent sites for which an inflection was not observed in the latter solvent. Titration curves of Al-saturated montmorillonite in AN showed evidence of a salt-induced hydrolysis which was confirmed by titration curves of salt extracts. The hydrolysis reaction was more evident in AN than in  $\text{H}_2\text{O}$  and was probably due to a disruption of the  $\text{H}_2\text{O}$  structure by AN and a polarization of the  $\text{H}_2\text{O}$  of solvation. The hydrolysis reaction was enhanced in the presence of excess salt due to the ion exchange of  $\text{H}^+$  from the exchange surface. These studies indicate that acidic properties of clays may be drastically altered in organic solvents. The acidic properties may be used to advantage, for example, in the determination of edge-site acidity. In addition, they have implications concerning possible chemical reactions and/or alterations of clay in organic solvents.

**Key Words:** Acetonitrile • Acidic properties • Dimethylformamide • Hydrolysis • Montmorillonite • Water

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