
Titration of pH-Dependent Sites of Kaolinite in Water and Selected Nonaqueous Solvents

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Abstract: K-saturated kaolinite was titrated in 13 different solvents with tetrabutylammonium hydroxide using a combination electrode for potentiometric determination. The titer of base required to reach the final potentiometric endpoint was dependent on the solvent and increased according to the following solvent order in both the presence and absence of excess neutral salt: methanol \leq water < ethanol \leq 1-propanol < 1-butanol < 2-propanol < DMF < t-butanol < DMSO < pyridine \leq acetonitrile \leq methylethyl ketone < acetone. With the protic solvents, titratable acidity increased according to decreasing dielectric constant of the solvent and increasing size and/or branching of the aliphatic constituent. The largest titratable acidities were obtained in the dipolar aprotic solvents with negligible basic character (e.g., acetonitrile, acetone, methylethyl ketone). These results are discussed in terms of solvent properties, solvation characteristics of ions in the solvents, and acid-base behavior of crystalline edge sites.

Key Words: Acidity • Kaolinite • Solvents • Titration

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