Some Colloidal Properties of Beidellite: Comparison with Low and High Charge Montmorillonites

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Abstract: Recent evidence of the occurrence of beidellite in many soils around the world necessitates a better understanding of the role of charge location on the colloidal behavior of this smectite as compared to the more frequently studied montmorillonites. Clay suspension stability and sorption of an organic polymer, two properties sensitive to surface charge characteristics, were selected to examine the differences in colloidal behaviors of these smectites. The Otay montmorillonite was shown to have a higher charge than either the beidellite or the SWy-1 montmorillonite. Even though structural formulae resulted in a higher permanent charge for the beidellite as compared to the SWy-1, effective charge of these two smectites is the same. The pH dependency of the critical coagulation concentration of the smectites could not be explained based only on edge charge considerations, and it is proposed that tetrahedral charge location enhances the pH effect on the CCC. Decreased poly(vinyl) alcohol sorption with either increasing surface charge or tetrahedral charge location was observed. Both parameters affect the ease of replacement of water molecules by PVA on the surface of smectites.

Key Words: Beidellite • Charge location • Coagulation • Poly(vinyl) alcohol • Surface charge density

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