



Acid-base and adsorptive properties of Tunisian Smectite

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Received 12 December 2009; Accepted 26 June 2010

ABSTRACT

Smectite, which is a clay, is a promising material for a large number of applications. This is due to its specific properties i.e. cation exchange and surface complexation on amphoteric edge sites used to describe the uptake of aqueous metal species. This work addresses both properties, firstly by studying the acid-base properties of the Na and Zn-saturated smectites by using both mass and potentiometric titration methods, and secondly by studying Zn(II) adsorption as a function of pH and ionic strength. Mass titration was used to estimate the point of zero proton charge (PZC) by interpolation at different electrolyte concentrations. The potentiometric titration of the two clays suspensions between pH 3 to 11 at varying ionic strengths, 0.5 M, 0.1 M and 0.01 M NaCl was employed to characterize surface charge development on amphoteric edge sites and to graphically determinate the point of zero proton charge (PZC) which were in good agreement with those determined by mass titration. The surface charge formation was similar: positive charges can develop during the protonation reactions of Al-OH sites at edges only at pH values around the pH of PZC and deprotonation of Si-OH and Al-OH sites takes places with increasing pH of the solution resulting in negative charges at the surface edges. The experimental potentiometric data were fitted by applying diffuse double layer model (DDLm) to determine the equilibrium constants of protonation and deprotonation processes using graphic regression, ProtoFit and PHREEQC program. The adsorption of Zn(II) onto a suspension of Na-saturated smectite from Elfahs (Tunisia) was studied as a function of the pH (3, 5 and 7) and ionic strength (0.5 M and 0.01 M NaCl). The adsorption data was then fitted to Freundlich and Langmuir isotherms models.

Keywords: Adsorption; Point of zero charge; Clay; Acidity

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