

THERMODYNAMIC CALCULATIONS OF Hg(II)-GIBBSITE INTERACTIONS BY NONVARIABLE CHARGE MODELS

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As discrete particles or as surface coating on other minerals in natural systems, aluminum hydroxides (Gibbsite) are efficient sinks for Hg(II). Adsorption of Hg(II) on gibbsite was examined as a function of temperature (T), pH, adsorbate loading, the type of background electrolytes (i.e., NaNO_3 , NaClO_4 and NaCl) and their concentrations were used for comparisons.

When the equilibration time $t_E \sim 2$ h, the Hg(II) retention on gibbsite was found to be a reversible process, and found that the true adsorption occurred at the interface as further confirmed by means of Fourier Transform Infrared (FTIR) spectroscopy. The Hg(II) adsorption capacity, i.e., $\Gamma_{\text{Hg(II)}}$, varied with the type of used background electrolyte in accordance with the following order:

$$\Gamma_{\text{Hg(II)}}^{\text{NO}_3^-} \geq \Gamma_{\text{Hg(II)}}^{\text{ClO}_4^-} > \Gamma_{\text{Hg(II)}}^{\text{Cl}^-}. \text{ In all cases, the estimated thermodynamic}$$

parameters showed that the Hg(II) adsorption on gibbsite was endothermic and spontaneous.

The Hg(II) adsorption data were quantified with the Langmuir or Hill and Dublin-Radushkevick (DR), isotherms at all temperatures and acidify levels examined. Always, the Hg(II) adsorption data complied with the DR model. However, the Hg(II) adsorption was model well with the Hill equation. The mean free energy values calculated from DR plots concluded that Hg(II)-gibbsite interactions are a result of chemical bonding as further supported by FTIR observations.