Comments on “Ion adsorption components in liquid/solid systems”

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Recently, Wu *et al.* (J Environ Sci 18(2006) 1167–1175) published a paper entitled as above. In the paper, the authors proposed a plotting method for describing adsorption isotherms, where adsorption density (q_e) was plotted against the ratio of equilibrium concentration/particle concentration (C_e/W_0) rather than C_e as traditionally defined. The authors claimed that this plot can eliminate the “particle concentration effect” (i.e., adsorption isotherms decline with increasing particle concentration), which may otherwise be inevitable with traditionally defined adsorption isotherms. We think that their conclusion is conceptually flawed and the plot may cause substantial inconsistency problems in practice.

Apparently, when adsorption density (q_e) is plotted against C_e/W_0 , the “adsorption isotherm” obtained (Figs. 1c and 2 c) for low particle concentration (low W_0) will be mathematically shifted to the left or lifted to a higher position than traditionally defined adsorption isotherm (a plot of q_e vs. C_e). However, this treatment cannot shift all the isotherms under different W_0 (for a given adsorption system) to the same position so that an inconsistency problem will be created. For example, it is well known that many adsorption systems do not have particle concentration effect (O’Conor and Connolly, 1980; Pan and Liss, 1998a, b; Li *et al.*, 2004), when this plot is applied to these systems the originally constant isotherms will be artificially separated into different isotherms (inconsistency problem), causing substantial confusion in data comparison.

The main reason why Wu *et al.* (2006) thought that adsorption isotherms should be correlated to C_e/W_0 rather than C_e is because the authors reached their deduced conclusion starting from the equation $q_e = (C_0 - C_e)/W_0$ (Section 2.2). This is only a mass balance equation, which does not necessarily describe the solid-liquid adsorption behavior. The adsorption experiments must satisfy the mass balance law, however, mass balance principle alone does not describe the thermodynamic relationships between q_e and C_e for surface adsorption reactions. The latter is described by various isotherm equations (Giles *et al.*, 1974).

References

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