

Acid-base transport model of interfacial reactions for dynamic pH response quantification and regulation

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Abstract

The dynamic pH response resulting from acid-base transport of interfacial reactions greatly influences the kinetic performance and process mechanism, but its theoretical foundation is lacked. Herein, a generalized acid-base transport model is established owing to the success in deriving buffer transport equations and is experimentally through the relationships of buffer transport limiting current versus solution pH and buffer concentration (CB). The relationships bring forth the parameter determination methods of buffers with the superiority of facile survey of practical parameter values. Based on model calculations, the dynamic pH response is drawn as a j-pH diagram to show the buffer transport law in the full pH range, highlighting the rate-limiting effect. The buffer operation principles are graphically presented as CB- Δ pH diagrams to aid economic buffer applications. This study has laid the foundation for quantification and regulation of dynamic pH response and is of wide interest to the chemistry encompassing interfacial processes.

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