A Comparative Study on Expressions of Thermodynamic Distribution Data for Ion Exchange Separation

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Summary

In various reports by many authors, ion exchange data were described by using ion exchange isotherm, Langmuir equation, Freundlich equation, Gains-Thomas and Vanselow equations, and others. It is highly desirable to describe these data in a systematic way to cover thermodynamics, kinetics and dynamics of ion exchange. Some representative expressions of distribution data determined on organic resins and inorganic materials were compared with a view to utilizing them for separation design.

In this report, the following subjects were studied:

1) Test of representative thermodynamic model on ion exchange data

Thermodynamic models for ion exchange process were proposed and used by Gains-Thomas, Vanselow, Gapon and Högfelt. The parameters in them were examined in the light of its ease of use and generality. The effect of electrolytes, their concentration, and temperature was studied using these models..

2) Evaluation of activity coefficient of mixed electrolytes

The activity coefficient of mixed electrolytes needs to be used for calculating the activity of electrolyte in solution instead of single electrolyte. Some equations have been proposed. In this report, Glueckauf's equation was used for evaluation.

3) Critical comparison of experimental data expressions

The above methodologies were used and compared critically.

4) Parameters for ion exchange database

It was considered that which parameters are of the primary importance for ion exchange database. Typical examples were taken from some data of ion exchange resins and several inorganic ion-exchange materials.