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U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Two White Flint North
11545 Rockville Pike
Mail Stop T8A23
Washington, DC 20555

Subject: Programmatic Review of Abstract

Dear Mrs. DeMarco:

The enclosed abstract is being submitted for programmatic review. This abstract will be submitted for presentation at the Water-Rock Interactions, to be held June 10–15, 2001, in Sardinia, Italy. The title of this abstract is:

> "Prediction of Model Parameters for Zeolite Ion-Exchange Equilibria" by Roberto Pabalan and Paul Bertetti

This abstract is a product of the CNWRA and does not necessarily reflect the view(s) or regulatory position of the NRC.

Please advise me of the results of your programmatic review. Your cooperation in this matter is appreciated.

Sincerely,

Budhi Sagar
Technical Director

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Enclosure

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Prediction of Model Parameters for Zeolite Ion-Exchange Equilibria

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Zeolite minerals are potentially useful in the treatment of nuclear, municipal, and industrial wastewaters and acid mine drainage waters. Zeolites could also serve as barriers for radionuclide migration from geologic repositories of high-level nuclear waste. One example is the proposed repository at Yucca Mountain, Nevada, which is underlain by diagenetically altered, zeolite-rich volcanic tuffs. However, there is a lack of experimental data for many systems of interest. In this study, published experimental data on ion exchange involving the zeolite mineral clinoptilolite and alkali and alkaline-earth cations, including Li^+, Na^+, K^+, Rb^+, Cs^+, NH_4^+, Ca^{2+}, and Sr^{2+}, are used to derive parameters for a solid solution model based on the Wilson equation and equilibrium constants for binary ion-exchange reactions. Where experimental data are not available, equilibrium constants are derived using the 'triangle rule,' i.e., the equilibrium constant for ion exchange involving cations A and C is derived from the known equilibrium constants for A/B and B/C ion exchange. Correlation methods are also investigated as a means for estimating the Wilson parameters. The results indicate that, for the systems studied, correlation methods are generally successful in predicting solid solution parameters. The estimated equilibrium constants and parameters are used to predict ion-exchange isotherms as functions of aqueous composition and ionic strength.

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