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BOOK OF ABSTRACTS

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PIII-52. Thermodynamic Models of the H_2O – HNO_3 – $UO_2(NO_3)_2$ and H_2O – HNO_3 – $Th(NO_3)_4$ systems

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The manufacture of the wet-process phosphoric acid produces a large amount of phosphogypsum as a by-product. Although gypsum is a widely used material in the construction industry, phosphogypsum is usually not used mainly because of its weak radioactivity. The long-term storage of phosphogypsum is unfavorable because it requires great capital expenditures and operational costs. Also, phosphogypsum stacks, occupying large territories, are harmful for the environment and for the people's health. All the mentioned makes the problem of removal of the radioactive contaminants from the phosphogypsum very vital.

Several routes of purification of phosphogypsum (i.e. extraction, leaching and sieving) are present, but still these processes are studied relatively poorly. Most of the works concerning them deal with some empiric correlations and often they just state the fact of redistribution of the radioactive species depending on the initial conditions of the processing. To understand these processes better and to have a tool for prediction the behavior of phosphogypsum and its contaminants in a broad range of conditions, a comprehensive thermodynamic model is needed.

Concerning some routes of the phosphogypsum processing, the systems H_2O – HNO_3 – $UO_2(NO_3)_2$ and H_2O – HNO_3 – $Th(NO_3)_4$ are of prior interest. So, the aim of this work is to introduce thermodynamic models of the systems mentioned.

Pitzer model was used to fit the experimental data including vapor-liquid equilibrium data, osmotic coefficients, and solubilities in a wide range of temperatures at an atmospheric pressure. Modeling was conducted stepwise with the number of components increasing gradually. Parameterization of the model was carried out by the method of least squares. The minimized objective function was the sum of squared residuals of calculated and experimental values.

The results of this work can be useful for the optimization of the complex processing of phosphogypsum.

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[1] R. Goldberg, *Journal of Physical and Chemical Reference Data*, 1979, 8, 1005.

[2] K. Pitzer, *The Journal of Physical Chemistry*, 1973, 77, 268.