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## Complexation of Eu(III) with phosphate ions: a spectroscopic and thermodynamic study

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The development of innovative technologies for improving recovery and recycling of critical raw materials such as REE from ore bodies is of paramount interest for the worldwide economy to safeguard a steady supply of raw materials. The modeling of flowsheets representing the variety of the involved physicochemical operations is highly dependent on reliable thermodynamic data. Thermodynamic-based prediction is a cost-effective and time-saving approach, which allows increasing the economic efficiency and the environmental sustainability namely with respect to extraction and recycling processes.

One prominent example where relevant thermodynamic data is scarce or even completely missing is related to the complexation of lanthanides with the ubiquitous aqueous phosphate ions. Consequently, our study wanted to close a critical gap of knowledge related to the coordination chemistry of lanthanides (Eu) with phosphate and to derive complexation constants for spectroscopically identified species (by means of laser-induced luminescence spectroscopy) at different pH, ionic strength, and temperature. The specific ion interaction theory was applied to extrapolate the experimental complexation constants to infinite dilution ( $\log \beta^\circ$ ) as well as to derive respective ion interaction coefficients ( $\epsilon$ ). Thermodynamic parameters such  $\Delta_R H^\circ$  and  $\Delta_R S^\circ$  were derived by using the linear van't Hoff equation.