THEME 3:
Volatiles of the Earth

Session 3.6:

Solubility, transport and hydrothermal ore deposition

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This session will integrate recent contributions from experimental solubility and spectroscopic studies with ab-initio and molecular-dynamics simulations focussed on improving our fundamental understanding of aqueuous complex stability and surface kinetics in fluid-mineral systems at high pressure and temperature. The session should also attract contributions involving biotic and organic interactions at higher temperatures. We would like to link studies of fundamental material properties of the ore minerals with quantitative applications of such data to natural geologic systems. Of particular interest today are natural magmatic-hydrothermal and basin-hosted environments and their role in ore formation and oceanic hydro-thermal systems that support biocommunities at extreme conditions.

3.6.11

Stability of acetate complexes of Eu and Y from 25 to 175°C and 1 to 1000 bars: A potentiometric study

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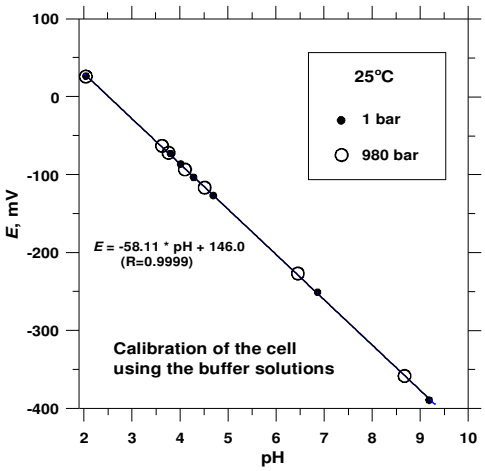
Thermodynamic association constants for two acetate complexes of europeum ($Eu(Ac)^{2+}$ and $Eu(Ac)_2^{+}$) and three acetate complexes of yttrium ($Y(Ac)^{2+}$, $Y(Ac)_2^{+}$, and $Y(Ac)_3^{\circ}{}_{(aq)}$) were determined by potentiometry from 25 to 175°C and 1 to 1000 bars. Measurements were performed using high temperature and high pressure potentiometric cell involving pH glass electrode and Ag, AgCl (3m KCl) reference electrode with liquid junction. The stable flow out of the inner electrolyte eliminates the diffusion potential. Different potentiometric approches and various types of pH glass and reference electrodes were used. It was shown that the *e.m.f.* of isothermal cell is independent of pressure (fig.).



The association constants for all acetate complexes (K_1-K_3) were established to increase sharply with increasing temperature and to decrease weekly with increasing pressure. Obtained temperature and pressure dependences of these constants differ significantly from those predicted by the thermodynamic database Slop98.

As a result, the standard partial molal HKF thermodynamic properties and HKF equation of state parameters for all acetate complexes of Eu and Y were determined. These data allow reliable prediction of thermodynamic behaviour of these species spanned in the whole temperature and pressure of the revised HKF model (up to 600°C and 5000 bar).

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