# Adjustment of activity coefficients as a function of changes in temperature, using the specific interaction theory

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The aim of this work is to propose and to check approximations to calculate from only a few experimental measurements, ionic strength $I$ and temperature $T$, influences on Gibbs' energy $G$, formal redox potential $E$ and standard equilibrium constant $K$. Series expansions *vs.* T are first used: $S$ and $C_p/2T°$ are typically the first- and second-order terms in $-G$. In the same way, $-\Delta H$ and $T^2 \Delta C_p/2$ are the first- and second-order terms of $R \ln K$ expansions *vs.* $1/T$. This type of approximation is discussed for $E$ of the $M^{4+}/M^{3+}$, $MO_2^{2+}/MO_2^{+}$ and $MO_2(CO_3)_3^{4-}/MO_2(CO_3)_3^{5-}$ couples (M $\equiv$ U or Pu) measured from 5 to 70 °C, for the standard $\Delta G$ of some solid U compounds, calculated from 17 to 117 °C, and for $\Delta C_p$, $\Delta G$ and log $K$ of the $CO_{2(aq)}/HCO_3^{-}$ equilibrium from 0 to 150 °C. Excess functions $X^{ex}$ are then calculated from activity coefficients γ: enthalpy $H$ or heat capacity $C_p$ adjustment as a function of $I$ changes is needed only when the γ adjustment as a function of $T$ changes is needed. The variations in the specific interaction theory coefficient $\epsilon$ with $T$ are small and roughly linear for the above redox equilibria and for the mean γ of chloride electrolytes: first-order expansion seems enough to deduce $\epsilon$, and then the excess functions $G^{ex}$, $S^{ex}$ and $H^{ex}$, in this $T$ range; but second-order expansion is more consistent for estimation of $C_p^{ex}$.