5.10 Activity of solutions of condensed systems (liquid, solid)

Completely analogously to the fugacity in Eq. (3.79) we now define the activity a_k to describe non-idealities of mixing with respect to a component k in the mixture; for the chemical potential of component k we find

$$\begin{aligned} a_k &= x_k \gamma_k \\ \mu_k &= \mu_k^0 + RT \ln a_k = \mu_k^0 + RT \ln x_k + RT \ln \gamma_k = \mu_k^{id} + \mu_k^{ex} \\ \Rightarrow \mu_k^{id} &= \mu_k^0 + RT \ln x_k \quad \text{and} \quad \mu_k^{ex} = RT \ln \gamma_k \end{aligned} \tag{5.30}$$

Again we introduced an activity coefficient γ_k which is determined by μ_k^{ex}.
As we will see, the general problem is what kind of state is defined as standard:

- For ideal samples: pure component, standard conditions.
- For solvents of a liquid solution: pure component.
- For solutes of a liquid solution: hypothetical standard.

For the standard state we always assume the pure component and $\gamma = 1$.
For the notation of the standard states by convention "A" is the solvent, "B" is the solute, and "*" indicates the pure phase.