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surface chemical potential

Defined by:

$$\mu_i^\sigma = \left(\frac{\partial A^\sigma}{\partial n_i^\sigma}\right)_{T,A_\mathrm{S},n_j^\sigma} = \left(\frac{\partial G^\sigma}{\partial n_i^\sigma}\right)_{T,p,\gamma,n_j^\sigma}$$

$$\mu_i^\mathrm{S} = \left(\frac{\partial A^\mathrm{S}}{\partial n_i^\mathrm{S}}\right)_{T,V^\mathrm{S},A_\mathrm{S},n_j^\mathrm{S}} = \left(\frac{\partial G^\mathrm{S}}{\partial n_i^\mathrm{S}}\right)_{T,p,\gamma,n_j^\mathrm{S}}$$

where A^σ is the surface excess Helmholtz energy, G^σ is the surface excess Gibbs energy A^S is the interfacial Helmholtz energy, G^S is the interfacial Gibbs energy, and A_S is the surface area. The quantities thus defined can be shown to be identical, and the conditions of equilibrium of component i in the system to be

$$\mu_i^\alpha = \mu_i^\sigma = \mu_i^\mathrm{S} = \mu_i^\beta$$

where μ_i^α and μ_i^β are the chemical potentials of i in the bulk phases α and β. (μ_i^α or μ_i^β have to be omitted from this equlibrium condition if component i is not present in the respective bulk phase.) The surface chemical potentials are related to the Gibbs energy functions by the equations

$$G^\sigma = \sum_i n_i^\sigma \mu_i^\sigma$$

$$G^\mathrm{S} = \sum_i n_i^\mathrm{S} \mu_i^\mathrm{S}$$

Source:

PAC, 1972, *31*, 577 *(Manual of Symbols and Terminology for Physicochemical Quantities and Units, Appendix II: Definitions, Terminology and Symbols in Colloid and Surface Chemistry)* on page 602