

Chemical Potential – Important Key to the Understanding of Chemical Thermodynamics

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The calculation of chemical reactions can begin *in medias res* with a definition of the chemical potential μ . The simplest way to introduce this quantity to first-year students and even pupils without frightening mathematical apparatus is by characterizing it by its typical and easily observable properties. This is followed by a direct measuring procedure, a method normally used for the quantification of basic concepts such as length, time or mass. The proposed approach immediately leads to practical results. To predict whether or not a considered reaction is possible is very simple if we use the chemical potential. Moreover, the chemical potential is key in dealing with problems in the field of chemical thermodynamics. Based on this central concept, it is possible to explore many other areas of application [1, 2]. The dependence of the chemical potential upon temperature, pressure and concentration is the “gateway” to the construction of phase diagrams, the deduction of the mass action law, and the calculation of equilibrium constants, solubilities, and many other data. The concept can be expanded easily to colligative phenomena (such as osmosis), diffusion processes, surface phenomena (such as adsorption), and so on. Furthermore, the same tools allow us to solve problems dealing with atomic and molecular phenomena that are usually treated by quantum statistical methods.

Illustrative but nevertheless easily and safely realizable demonstration experiments arouse the students' interest, help to strengthen the understanding and forge links with everyday experience. In addition to the poster presentation, short video films of selected experiments will be shown.

References

- [1] G. Job, R. Rüffler, *Physical Chemistry – an Introduction with New Concept and Numerous Experiments*, Vieweg+Teubner, Wiesbaden, 2010 (in German; English edition in preparation).
- [2] G. Job, *Proc. Taormina Conf. on Thermodynamics, Classe I di Scienze Fis. Mat. e Nat. Vol. LXX – Suppl. N. 1, 1992, 385-409.*