Chemical Potential – Key in Dealing with Physicochemical Problems

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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 can be used in school starting already with the first chemistry lessons, and it 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 physicochemical problems. Based on this central concept, it is possible to explore many other fields [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 diffusion processes, surface phenomena (such as adsorption), colligative phenomena (such as osmosis), electrochemical processes, 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 realisable demonstration experiments contribute strongly to comprehension 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 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.