Teaching Thermodynamics: Chemical Potential from the Beginning

R. Rüffler, G. Job

Job-Foundation, Institute of Physical Chemistry,
Grindelallee 117, 20146 Hamburg, Germany (regina.rueffler@job-stiftung.de)

The chemical potential, commonly described as the partial derivative of a quantity in which energy and entropy are involved, is often regarded as a difficult concept – not only by first-year students. On the other hand it is very useful for the accurate description of the chemical and physical behaviour of substances. For example, it is possible to predict by means of the chemical potential whether a considered reaction is possible or not, which yield can be expected, what can be done to improve this yield and so on. Furthermore, its temperature, pressure and concentration dependency allows to calculate phase diagrams and many other data. In other words, the chemical potential takes a central position in the area of "chemical thermodynamics". As a fast and easy way without the frightening mathematical apparatus the chemical potential can be introduced by phenomenological characterization and metrication. Starting from this central quantity, it is possible to explore many other fields up to quantum statistics.