

Teaching Thermodynamics: Chemical Potential from the Beginning

Georg Job

Abstract. Since 1973 a new concept of chemical thermodynamics has been used in the beginner's course of chemistry at the University of Hamburg, in which the chemical potential is introduced in the first lesson.

The course has the following characteristics:

- (1) The affinity of a reaction is introduced by using a direct measuring method (like length, time or mass) using neither energy nor entropy. The chemical potential of a substance is defined as the affinity of the decomposition reaction of this substance into the elements in their standard states.
- (2) The pressure, temperature, concentration dependence of the chemical potential is discussed using only linear functions in the first stage. Logarithmic equations are used in the next stage to describe the mass action of a solute or gaseous substance.
- (3) Various applications are discussed qualitatively and quantitatively: stability of compounds, phase transitions, calculation of melting and boiling points and their dependence on pressure, vapour pressure curve, solubilities and equilibrium constants including their temperature and pressure dependence ... up to MAXWELL's distribution law of molecular velocities (further colligative properties, diffusion and migration, chemical kinetics, multiphase systems, elektromotive forces etc. not described here).
- (4) Entropy is introduced only for the description of the thermochemical phenomena (not described here).