

CHEMICAL POTENTIAL – A QUANTITY IN SEARCH OF RECOGNITION

Chemical Equilibrium: Experiments and Interpretation

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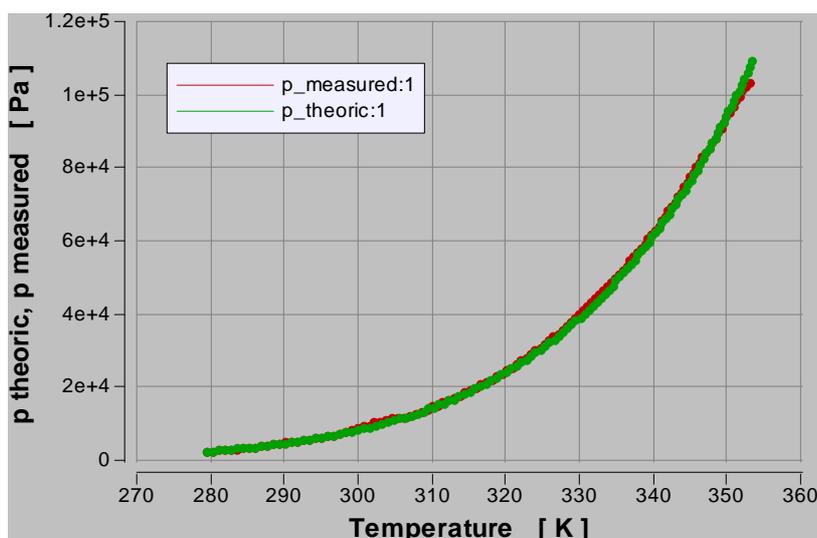
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Many phenomena that have to do with reactions are based on the fact that the chemical potential depends on temperature, pressure and concentration. Usually the mathematical functions that describe the corresponding dependencies are quite complicated. For practical purposes, however, it is often sufficient to approximate these functions linearly.

Two simple experiments involving chemical equilibrium will be described and discussed using such linear dependences for the chemical potential of the chemical species involved. The first example will deal with liquid-vapor phase equilibrium. The theoretical prediction for the temperature dependence of the vapor pressure of ethanol will be derived, and the obtained results will be compared with the measured data (figure 1).



a)



b)

Figure: 1a) Experimental set up for the measurement of the temperature and the vapor pressure of ethanol: a vessel containing a small amount of ethanol, provided with a temperature and an absolute pressure sensor, is immersed in a thermostatic water bath. 1b) Comparison between the experimental data and the theoretical vapor pressure values obtained using the chemical potential of liquid and gaseous ethanol.

The second example will deal with a chemical reaction. The temperature dependence of the equilibrium constant for a reaction involving $\text{NO}_2(\text{g})$ and $\text{N}_2\text{O}_4(\text{g})$ at constant volume will be investigated. The theoretical prediction will be compared with measured data.

Eventually we will outline how it is possible to get dynamical models, based on the explicit use of the chemical potential and on the constitutive laws of the system under study as far as the considered processes are sufficiently close to equilibrium. Some preliminary results will be presented and discussed.