Equilibrium partitioning of organic compounds

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## **Frequently asked questions**

1) The partitioning of a chemical *i* from phase 1 to phase 2 does not only involve a change in the interaction energies of this chemical but also a change in the interaction energies of the phase molecules that are/ were surrounding chemical *i*. How is this accounted for in the free energy balance?

**Answer:** All these energy changes are attributed to chemical *i*, because they originate from the phase transfer of this chemical. The sum of these energies defines the partition constant of *i* between the two phases.

2) Does the saturation vapor pressure of a liquid chemical in a vessel change if vacuum is applied?

**Answer:** NO! What does change however, is the boiling point. It is defined by the temperature at which the vapour pressure equals the ambient pressure. When the ambient pressure decreases, also the boiling temperature decreases.

What ist the practical significance of the boiling point? When the liquid reaches the temperature at the boiling point, bubbles form because the liquid has enough energy to overcome ambient pressure. Thus, at the boiling point evaporation occurs very quickly because no saturated gas phase layer can develop above the liquid => any liquid molecule heated above the boiling point will directly leave the condensed phase. Therefore, the liquid cannot be heated to a temperature higher than the boiling point. As a consequence, water cannot be heated to 100 °C in high altitudes.

On the Tibetan plateau, in 4.5 km above sea level, the atmospheric pressure is only 57 kPa. Under these conditions water reaches the saturation vapour pressure already at 85 °C. This makes cooking quite difficult. The vapour pressure of water could be lowered by adding salt, because then the boiling temperature rises again, but this effect is too small to justify oversalting and spoiling the soup: 9 mass-% NaCl lowers the vapour pressure of water only by a factor of 0.94. The water in Tibet would then boil at 86 °C.