The Solubility of Gases in Liquids

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Chemical thermodynamics is a highly formalized scientific discipline of enormous generality. In combination with specific models of material behavior, it is at the heart of many branches of science and engineering. In particular, the thermodynamic treatment of *dilute* solutions is of great practical and theoretical importance. The aim of this contribution is (I) to review concisely the thermodynamic formalism relevant for describing the (low pressure) solubility of gases in liquids,[1-5] and (II) to summarize some important experimental results with emphasis on aqueous solutions.[6,7] This will include a critical examination of current methods for the prediction of auxiliary quantities needed for the practical implementation of the derived exact relations. That is, estimation techniques for virial coefficients and partial molar volumes at infinite dilution will be discussed. The preponderance of work on aqueous systems reflects the fact that water is our environment's primary and indispensable solvent.

Various aspects of the solubility of gases in liquids have been included in recent monographs and state-of-the-art surveys, though with greatly differing coverage and from a variety of viewpoints. Besides descriptive presentations of experimental results, of instrumentation and corresponding experimental techniques, emphasis was placed, for instance, on formal thermodynamics, on application of group-contribution methods, on critical behavior, on hydrophobic effects in "simple" model solutions, etc. In fact, the latter topic was treated in my key communication at the PhandTA 6 in Ascona, Monte Verità, Switzerland, May 2002.

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