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Analytical Phase Equilibrium Function for Mixtures Obeying Raoult's and Henry's Laws[1] ROBERT HAYES, North Carolina State University — When a mixture of two substances exists in both the liquid and gas phase at equilibrium, Raoults and Henry's laws (ideal solution and ideal dilute solution approximations) can be used to estimate the gas and liquid mole fractions at the extremes of either very little solute or solvent. By assuming that a cubic polynomial can reasonably approximate the intermediate values to these extremes as a function of mole fraction, the cubic polynomial is solved and presented. A closed form equation approximating the pressure dependence on mole fraction of the constituents is thereby obtained. As a first approximation, this is a very simple and potentially useful means to estimate gas and liquid mole fractions of equilibrium mixtures. Mixtures with an azeotrope require additional attention if this type of approach is to be utilized.

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