Mixtures of Ideal Components are not Ideal

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Significant deviations from independence occur in all mixtures (even of 'ideal' gases: Mayer and Mayer, 1940, p. 203; Rowlinson and Swinton, 1982), not only electrolyte solutions, although there the effects are much larger. Mixtures of gases show strong departures from ideal behavior (e.g., Chapman and Cowling, 1970). Liquid mixtures cannot be understood "… solely from a knowledge of the pure components. Such attempts rest upon the fallacy that the forces $(\alpha - \beta)$ between two molecules of species α and β are always determinable from the strengths of the forces $(\alpha - \alpha)$ and $(\beta - \beta)$. If it were true that the $(\alpha - \beta)$ forces were always some 'average' of the $(\alpha - \alpha)$ and $(\beta - \beta)$ forces, then the properties of a binary mixture would be predictable in principle solely from a knowledge of those of the two pure components. However, such averaging is not universally valid. It is true that for very simple substances and for the prediction of relatively crude properties there are suitable averages …. However, such averaging is unsatisfactory for many classes of substances and inadequate for the detailed interpretation even of the simplest mixtures. One should rather take the observed properties of a binary mixture …." (Rowlinson and Swinton, 1982, p. 86).

Chapman, S. and Cowling, T.G. (1970). ***The Mathematical Theory of Non-Uniform Gases***. (3rd Edition). Cambridge University Press, Cambridge.

Mayer, J.E. and Mayer, M.G. (1940). ***Statistical Mechanics***. John Wiley & Sons, New York.

Rowlinson, J.S. and Swinton, F.L. (1982). ***Liquids and Liquid Mixtures.*** Butterworth Scientific. New York.

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