Endeavoring to provide some more satisfactory agreement, we have found that satisfactory results are obtained when it is assumed that the fugacity computed according to Bartlett's rule is the geometrical mean of the true fugacity and the fugacity computed according to the Lewis–Randall rule

$$f{:}f_B = f_B{:}f_{L.R.} \qquad (8)$$

where f is the true value of the fugacity, f_B the fugacity computed by Bartlett's rule and $f_{L.R.}$ the one computed by the Lewis–Randall rule.

Equivalent to equation (8) are the following conditions: the volume of a gas mixture computed by Bartlett's rule is the arithmetical mean from the true volume and the volume computed according to the Amagat law

$$V - V_B = V_B - V_A$$

where V is the true volume of the gas mixture, V_B and V_A, the volumes computed in accordance with Bartlett's and Amagat's rules, respectively.

As is to be seen from Figs. 1–5, compared to the rules of Lewis–Randall and Bartlett, the best results are obtained from equation (8).

The error of calculation of fugacity in gas mixtures by equation (8) makes mostly 2 to 5% and is often 10 times less than the error of the Lewis–Randall rule.

For ethylene and argon ($N_{C_2H_4} = 0.2$) Gillespie,[3] by combination of constants, has found better coincidence with the data of Gibson and Sosnick.[8] The error of calculation of fugacity was only 0.17% from 15–70 atm.

Although the combination of constants is the most exact of the approximate methods, nevertheless the methods proposed by us in view of their simplicity and sufficient accuracy can have scientific and engineering interest.

I am very indebted to J. S. Kasarnovsky for his help in making the calculations.

Summary

An equation is deduced for the computation of the fugacities in gas mixtures subordinate to the Bartlett rule. The examples of the systems argon–ethylene (to 125 atm.) and hydrogen–nitrogen (1000 atm.) prove that the Bartlett rule gives half the error of the Lewis–Randall rule.

For these systems an agreement with errors from 2 to 5% with the true fugacity values is attainable, if it be assumed that the fugacity computed in accordance with Bartlett's rule is the geometrical mean of the true fugacity and the fugacity computed in accordance with the Lewis–Randall rule.

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NOTES

The Thermal Decomposition of Gaseous Hydrogen Peroxide

By L. W. Elder, Jr.

In a recent note[1] commenting on the kinetics of the thermal decomposition of gaseous hydrogen peroxide, Kistiakowsky and Rosenberg have erroneously concluded that the data published by Elder and Rideal[2] correspond to a pressure increase of "about 1000%" instead of the theoretical 50%. This conclusion is apparently based on the assumption that the pressure readings as tabulated, *e. g.*, page 548, are total pressures. Actually these are manometer readings representing the pressure increase only, *i. e.*, based on a zero setting of the manometer at the start of the reaction. It is regretted that these pressures were not more explicitly identified in the tabulation as incremental pressures; however, this distinction is clearly shown by the coördinates of the curve (Fig. 2). On the other hand, the figures shown on page 547, involving total pressure readings, lead to an average pressure increase of 52%. This is as close to theoretical as could be expected in view of uncertainties regarding the initial concentrations after evacuating the charge at room temperature. No attempt was made to keep the initial concentrations at any predetermined value, since the "infinity" readings were used in every case for calculation of the rate constants.

General Foods Corporation
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(1) Kistiakowsky and Rosenberg, This Journal, **59**, 422 (1937).
(2) Elder and Rideal, *Trans. Faraday Soc.*, **23**, 545 (1927).