

In the following table are given the values of $\beta/0.02415$ calculated from these lines.

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From the data of these tables it can be concluded that in the neighbourhood of the freezing point of the solvent (65.9°K for CO, 63.1°K for N₂, 90.1°K for CH₄) the partial molar volumes of the dissolved hydrogen are approximately equal to one another and moreover seem also to lie very close to the molar volumes of liquid hydrogen at $p = 1$ atm. (28.6 cm³).

Roughly the same values result with the approximate calculation of the solubility data of H₂ in C₆H₆ at 298.1°K¹⁴, (since the data on the composition of the vapour phase are in error.)

TABLE II

solvent	T (°K)	$\frac{\beta}{0.02415}$
CO	68.1	0.987
CO	73.1	0.962
CO	83.1	0.790
N ₂	63.1	0.878
N ₂	78.1	0.882
N ₂	88.1	0.696
CH ₄	90.3	0.965*
CH ₄	110.0	1.002
C ₂ H ₄	188.1	0.787

*The calculation of these data according to eqn. (2) gave $\bar{v}_{H_2} = 6$ cm³.

It should be noted that the \bar{v}_{H_2} values calculated according to eqn. (5) are higher than those calculated according to eqn. (2) (where this is possible). This is, perhaps, an explanation of the fact that the partial molar volumes determined by dilatometric methods are also higher than those calculated according to eqn. (2).¹⁵

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It seems to us that the data and calculations outlined above bear out the applicability of the theory of regular solutions to concentrated solutions of hydrogen in non-polar liquids at high pressures.

The constancy of the \bar{v}_{H_2} values thus obtained with different concentrations and pressures obviously proves that the dependence of the partial molar volumes of the hydrogen on p and N does not lead to errors exceeding the magnitude of experimental error.

The fact that the \bar{v}_{H_2} values under certain conditions lie close to the values of the molar volume of liquid hydrogen is very interesting although an investigation on other gases is also required.

Unfortunately, the paucity of experimental data makes the application of the theory of regular solutions to the solutions of other gases difficult.

In the work of Iljinskaya¹⁵, it is to be noted the similarity of the values obtained by her for the partial molar volumes of the gases in water at 273.1°K, to the value of the constant 'b' in the Van der Waals equation. In the following table the mean values of the data obtained by her and other workers by dilatometric methods are compared with the constants 'b' and the molar volumes of the liquid gases at $p = 1$ atm.