

We now consider the change of the  $\log f_1/N_1$  value with the pressure according to the data of this table. At 63.1°K,  $\log f_1/N_1$  increases with the pressure so that it appears to follow eqn. (2). At 68.1°K

TABLE I

925

P-P <sub>2</sub> (atm)	N <sub>1</sub> mole fraction	N <sub>1</sub> <sup>*</sup>	$\lg \frac{f_1}{N_1}$	$\left(\frac{\sqrt{a_1}}{v_1} - \frac{\sqrt{a_2}}{v_2}\right)_p^2$	$(P-P_2^0) \left(\frac{N_1 \bar{v}_1 + N_2 \bar{v}_2}{N_2 v_2}\right)^2$
T = 63.1° K					
26.6	0.041	0.981	2.768	10.50	28.3
46.0	0.0075	0.982	2.714	10.60	52.0
55.4	0.083	0.984	2.742	11.08	63.8
89.5	0.120	0.963	2.743	11.87	110.0
118.4	0.146	0.968	2.770	12.85	153.7
147.3	0.172	0.957	2.810	13.90	206.5
176.3	0.189	0.937	2.795	14.74	252
205.3	0.216	0.935	2.823	15.46	304
215.0	0.222	0.929	2.835	15.75	321
T = 68.1° K					
16.9	0.033	0.973	2.684	8.90	17.7
26.3	0.046	0.976	2.724	9.46	28.2
35.7	0.066	0.976	2.691	9.54	39.7
45.6	0.076	0.979	2.728	10.06	51.9
55.6	0.094	0.973	2.709	10.30	65.4
89.4	0.147	0.953	2.687	11.06	116.0
118.2	0.181	0.944	2.704	12.18	165.5
147.1	0.219	0.922	2.700	12.84	218.0
176.1	0.250	0.903	2.718	14.30	284
T = 78.1° K					
35.5	0.073	0.930	2.633	8.79	40.1
54.4	0.119	0.937	2.600	8.95	66.8
78.8	0.175	0.922	2.577	9.71	109.3
112.5	0.248	0.895	2.594	11.63	186.5
146.3	0.334	0.840	2.495	11.82	292.6
160.8	0.379	0.813	2.493	14.15	381

926

$\log f_1/N_1 \approx \text{const.}$ , which can be construed as proof of the applicability of eqn. (1). But at 78.1°K (and at still higher temperature<sup>2</sup>)  $\log f_1/N_1$  decreases with increase of pressure i.e. on calculation with eqn. (2), negative values of the partial molar volume of hydrogen arise-which is very doubtful.

In Fig. 1 the data quoted above on the solubility of H<sub>2</sub> in N<sub>2</sub>, CO, CH<sub>4</sub> and C<sub>2</sub>H<sub>4</sub> are plotted in a co-ordinate system corresponding to eqn. (6).

The straight lines obtained from these prove that the partial molar volumes of hydrogen in one and the same solvent are equal at different concentrations and pressures (within the limits of experimental error).