Table 4 Experimental virial coefficients of gaseous ammonia

$Z=1+B(1/V)+C(1/V)^2+D(1/V)^3$

Temp. (°C)	B	C	D	Range of $1/V$	Deviation from exptl. values Average (%)	Maximum(%)
25	−0.2708	0.1272	−0.3396	0 to 0.45	0.15	0.24
50	−0.2172	0.0628	−0.0556	0 to 0.90	0.09	0.17
75	−0.1568	−0.00080	.....	0 to 1.75	0.19	0.44
100	−0.1361	0.00521	.....	0 to 3.00	0.10	0.33
125	−0.1150	0.004770	.....	0 to 6.00	0.10	0.20

$1/V$; (mol/l)

$Z=1+B'P+C'P^2+D'P^3+E'P^4$

Temp.(°C)	$B'\cdot10^3$	$C'\cdot10^6$	$D'\cdot10^6$	$E'\cdot10^8$	Range of P	Deviation from exptl. values Average (%)	Maximum (%)
25	−10.84	74	−30.4	.....	0 to 9.3	0.06	0.14
50	−7.477	−34.6	−2.90	.....	0 to 19.0	0.09	0.14
75	−5.438	−32.4	−0.607	.....	0 to 35	0.06	0.15
100	−4.403	−7.70	−0.358	.....	0 to 60	0.12	0.29
125	−3.442	−14.21	0.1584	−0.2354	0 to 90	0.17	0.38

P; (atm)

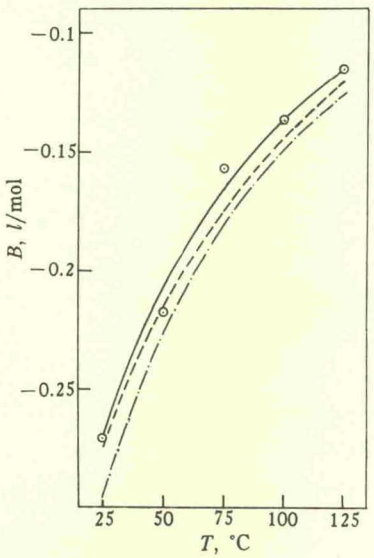

Fig. 5 Second virial coefficient of ammonia
—⊙—: This work
------: Correlated values with Beattie and Meyer's experimental data by Keyes
—·—·—: Calculated values assuming Stockmeyer potential funtion

shows that they have agreed very nearly with one another at 25, 50 and 75°C but there have been slight differences to one another at 100 and 125°C.

Another experimental work has been reported only by Keyes[13] for the *P-V-T* relations of liquid

12) "International Critical Tables", **III**, 234, 235, McGraw-Hill, New York (1928)
13) F. G. Keyes. *J. Am. Chem. Soc.*, **53**, 965 (1931)

Table 5 Compressibility factor of liquid ammonia

P (atm)	$Z=Pv/nRT$ 25°C	50°C	75°C	100°C	125°C
9.98	0.01156*				
20.05		0.02292*			
36.58			0.04223*		
50	0.05755	0.05672	0.05739		
61.65				0.07508*	
75	0.08600	0.08459	0.08522	0.09008	
98.15					0.1431*
100	0.1143	0.1122	0.1126	0.1176	0.1435
150	0.1702	0.1665	0.1661	0.1711	0.1866
200	0.2254	0.2200	0.2184	0.2222	0.2351
250	0.2800	0.2727	0.2695	0.2724	0.2832
300	0.3339	0.3246	0.3198	0.3213	0.3300
400	0.4398	0.4249	0.4179	0.4161	0.4209
500	0.5436	0.5246	0.5133	0.5082	0.5088

* These are at saturated vapor pressures.

Table 6 Comparison of saturated vapor pressure of ammonia

Temp. (°C)	Saturated vapor pressure (atm)		
	This work	Beattie *et al.*[9]	Int. Crit. Tables[12]
25	9.98	.....	9.90
50	20.05	20.07	20.06
75	36.58	.....	36.63
100	61.65	61.78	61.82
125	98.15	98.45	98.08

ammonia in these pressure and temperature ranges. In Table 7, the data by Keyes have been presented in terms of the specific volume at even pressures, to be compared with those of this work. Keyes had presented the smoothed PV values of ammonia in the ranges of 0 to 210°C and 100 to 1,100 atm in his report based on his experimental data.

It has been noted by him that his PV values were assured within an error of 0.25%. But they have some considerable irregularities, especially in the ranges of 0 to 30°C and 100 to 200 atm. Regarding this fact, it has been also pointed out by Davis[14], the reviewer, that there have been some unreasonable values in Keyes' data.

As shown in Table 7, Keyes' values are about 0.3 to 0.4% lower than those of this work at pressures of above 200 atm and at every temperature. Moreover, they are about 1% lower than those of this work at pressures of 100 atm and at temperatures of 50, 75 and 100°C.

In addition, the specific volumes of liquid ammonia at saturated vapor pressures have been obtained by extrapolating the experimental data down to the saturated vapor pressure at each tempera-

14) P. Davis, "Thermodynamic Functions of Gases", **I**, 66, Butterworths Sci. Publ., London (1956)