**Table II:** $\Lambda_p$ for Aqueous MnSO₄ Solutions at 25°

| $C \times 10^{4a}$ | 1 | 500 | 1000 | 1500 | 2000 |
|---|---|---|---|---|---|
| | | | *P*, atm. | | |
| 0 | 133.2[b] | 135.0 | 135.3 | 134.5 | 133.0 |
| 5 | 116.3[b] | 118.7 | 120.3 | 120.3 | 119.6 |
| 10 | 108.7[b] | 111.6 | 113.3 | 113.8 | 113.4 |
| 20 | 99.7[b] | 103.3 | 105.4 | 106.2 | 106.3 |
| 100 | 75.2[c] | 79.6 | 82.6 | 84.5 | 85.4 |
| 200 | 65.9[c] | 70.4 | 73.7 | 75.8 | 77.0 |

[a] $C$ is atmospheric pressure concentration in moles/liter.
[b] C. J. Hallada and G. Atkinson, *J. Am. Chem. Soc.*, **83**, 3759 (1961). [c] Measured this experiment.

**Table III:** Degree of Association $(1 - \alpha)$ for Aqueous MnSO₄ at 25°

| $C \times 10^{4a}$ | 1 | 500 | 1000 | 1500 | 2000 |
|---|---|---|---|---|---|
| | | | *P*, atm. | | |
| 5 | 0.070 | 0.065 | 0.055 | 0.050 | 0.046 |
| 10 | 0.115 | 0.105 | 0.094 | 0.085 | 0.079 |
| 20 | 0.172 | 0.155 | 0.140 | 0.129 | 0.119 |
| 100 | 0.345 | 0.316 | 0.292 | 0.271 | 0.255 |
| 200 | 0.415 | 0.383 | 0.355 | 0.332 | 0.314 |

[a] $C$ is atmospheric pressure concentration in moles/liter.

**Table IV:** Molal Dissociation Constant ($K_m$) and $\Delta \bar{V}^0$ for Aqueous MnSO₄ at 25°

| $P$, atm. | 0.0005 | 0.001 | 0.002 | 0.01 | 0.02 |
|---|---|---|---|---|---|
| | | | *C*, atm. press. concn., *M* | | |
| 1 | 0.0044 | 0.0044 | 0.0046 | 0.0052 | 0.0060 |
| 500 | 0.0048 | 0.0050 | 0.0053 | 0.0063 | 0.0073 |
| 1000 | 0.0059 | 0.0057 | 0.0062 | 0.0073 | 0.0086 |
| 1500 | 0.0066 | 0.0065 | 0.0069 | 0.0084 | 0.0099 |
| 2000 | 0.0073 | 0.0072 | 0.0077 | 0.0094 | 0.0111 |
| | | | $\Delta \bar{V}^0$, cc./mole[a] | | |
| 1 | −7.4 | −7.1 | −8.0 | −9.3 | −10.0 |
| 2000 | −5.3 | −5.0 | −4.8 | −5.0 | −5.0 |

[a] $\Delta \bar{V}^0$ was calculated by a least-squares fit of log $K$ to a quadratic curve.

**Table V:** Comparison of $K_m(P = 2000)/K_m(P = 1)$ for MgSO₄ and MnSO₄ Aqueous Solutions at 25°

| $C$, M | MgSO₄ | MnSO₄ |
|---|---|---|
| 0.0005 | 1.9 | 1.7 |
| 0.001 | 1.8 | 1.6 |
| 0.002 | 1.7 | 1.7 |
| 0.01 | 1.8 | 1.8 |
| 0.02 | 1.7 | 1.9 |

It is seen that at atmospheric pressure the value of $\Delta \bar{V}^0$, as concentration decreases, approaches that predicted from the Fuoss theory, namely, −7.4 cc./mole. There appears to be a concentration dependence of $\Delta \bar{V}^0$ at atmospheric pressure but not at 2000 atm.

A comparison in Table V of the ratios of the equilibrium constants at 2000 and 1 atm. indicates that a

**Table VI:** Comparison of $\Delta \bar{V}^0$ for MgSO₄ and MnSO₄ Aqueous Solutions at 25° and 1 Atm.

| $C$, M | MgSO₄ | MnSO₄ |
|---|---|---|
| | | $\Delta \bar{V}^0$, cc./mole |
| 0.0005 | −8.5 | −7.4 |
| 0.001 | −7.0 | −7.1 |
| 0.002 | −7.0 | −8.0 |
| 0.01 | −7.3 | −9.3 |
| 0.02 | −6.9 | −10.0 |

**Table VII:** Cell Constants[a]

| Concn., *M* | $L_1$ | $P$, atm. | $L^*_p$ |
|---|---|---|---|
| Cell constants at atm. press. | | Press. dependence of cell constant | |
| 0.0005 | 0.808 | 500 | 0.991 |
| 0.001 | 0.811 | 1000 | 0.986 |
| 0.002 | 0.812 | 1500 | 0.982 |
| 0.01 | 0.824 | 2000 | 0.979 |
| 0.02 | 0.829 | | |

[a] To find cell constant $L_p$ at pressure $P$ multiply atmospheric pressure value $L_1$ by $L^*_p$.

**Table VIII:** Copy of Original Conductivity Data Measured for Electrolytes at 25° in Aqueous Solutions (Teflon Cell without Glass Bar)

| | 1 | 500 | 1000 | 1500 | 2000 | 1[a] |
|---|---|---|---|---|---|---|
| | | | *P*, atm. | | | |
| 0.02 *M* KCl, mmhos | 3.338 | 3.484 | 3.582 | 3.639 | 3.670 | 3.322 |
| MnSO₄ | 3.118 | 3.436 | 3.681 | 3.868 | 4.008 | 3.104 |
| K₂SO₄ | 5.769 | 6.046 | 6.245 | 6.381 | 6.456 | 5.742 |
| MnCl₂ | 4.941 | 5.197 | 5.374 | 5.482 | 5.539 | 4.934 |
| 0.01 *M* KCl, mmhos | 1.715 | 1.790 | 1.840 | 1.871 | 1.886 | 1.709 |
| MnSO₄ | 1.812 | 1.977 | 2.101 | 2.196 | 2.264 | 1.802 |
| 0.002 *M* KCl, μmhos | 359.7 | 375.0 | 385.4 | 391.6 | 394.8 | 358.7 |
| MnSO₄ | 486.7 | 519.9 | 543.8 | 560.3 | 571.5 | 484.5 |
| K₂SO₄ | 684.4 | 712.6 | 732.3 | 744.6 | 751.4 | 681.2 |
| MnCl₂ | 575.6 | 602.6 | 620.3 | 631.5 | 637.1 | 573.2 |
| 0.001 *M* KCl, μmhos | 181.8 | 189.9 | 195.0 | 198.2 | 199.9 | 181.3 |
| MnSO₄ | 267.5 | 283.4 | 295.0 | 302.6 | 307.6 | 266.5 |
| 0.0005 *M* KCl, μmhos | 92.0 | 96.1 | 99.0 | 100.4 | 101.4 | 91.3 |
| MnSO₄ | 144.2 | 152.0 | 157.9 | 161.5 | 163.8 | 144.0 |
| K₂SO₄ | 181.8 | 189.5 | 194.5 | 197.5 | 199.6 | 181.3 |
| MnCl₂ | 153.4 | 160.7 | 165.7 | 168.8 | 170.3 | 152.9 |
| Water, μmhos | 0.5 | 0.7 | 0.9 | 1.1 | 1.3 | 0.8 |
| Series lead resistance, ohms | 0.134 | 0.134 | 0.134 | 0.134 | 0.134 | |

[a] The readings in this column were obtained the day after the pressure run was made.

different trend as a function of concentration exists between $MgSO_4$ and $MnSO_4$ solutions.

At atmospheric pressure and at the lower concentrations the values of $\Delta \bar{V}^0$ for both $MnSO_4$ and $MgSO_4$ agree with the value predicted by the Fuoss theory. For $MnSO_4$ there appears to be a dependence of $\Delta \bar{V}^0$ on pressure which was not observed for $MgSO_4$. Furthermore, there is a more noticeable concentration dependence of $\Delta \bar{V}^0$ at atmospheric pressure for $MnSO_4$ and in the opposite direction to that exhibited by $MgSO_4$, as shown in Table VI. The change in $\Delta \bar{V}^0$ is greater than would be accounted for assuming errors in $\Lambda_p/\Lambda_1$ to be as great as $\pm 0.5\%$.

The differences in the pressure behavior of these two salts may, in fact, be due to differences in the various ion-pair species which can be related to the differences in acoustic behavior. However, a multistate model cannot be deduced from conductivity data; these results can only provide a check for consistency of any multistate models which may be proposed.