VIII. MAGNETIC RESONANCE

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A. SELF-DIFFUSION IN LIQUID ETHANE

Measurements have been completed of the self-diffusion coefficient D of liquid C_2H_6 at temperatures between 155° and 298°K and between 1 and 2500 atm (Fig. VIII-1).

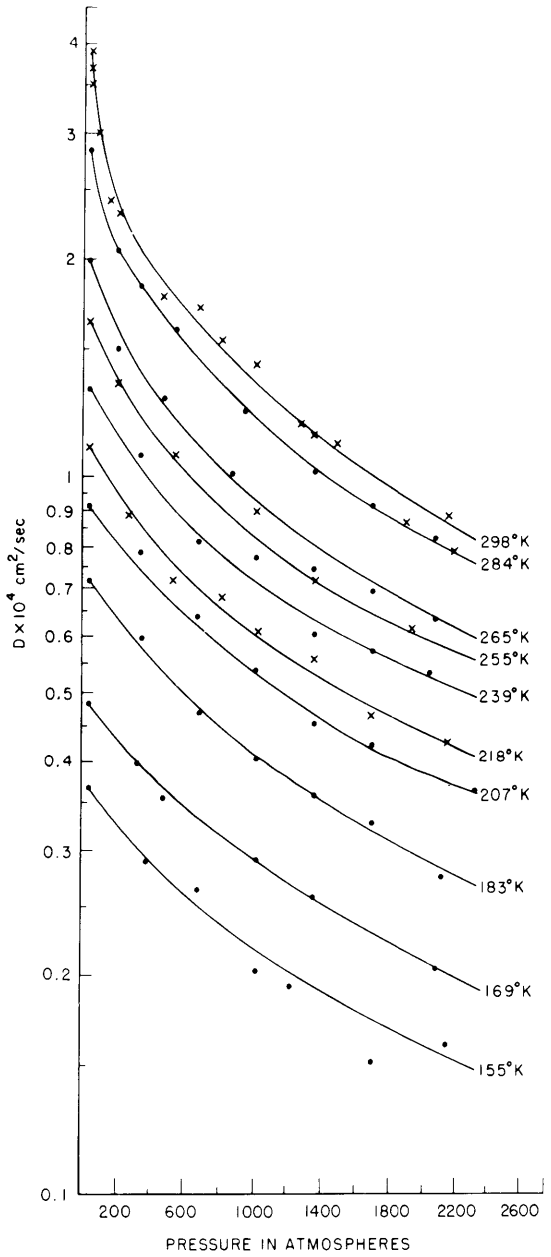

Fig. VIII-1. Dependence of the self-diffusion coefficient D in ethane on pressure at various constant temperatures.

Proton spin echoes were used for this purpose.[1] The equation of state was determined very approximately by measuring the pressure dependence of free-induction decay amplitudes at various constant temperatures. Thus it was possible to show (as anticipated) that the free-volume theory, which could be used to fit our earlier results at constant pressure,[2] is inconsistent with the experimental density dependence. Figure VIII-2 shows

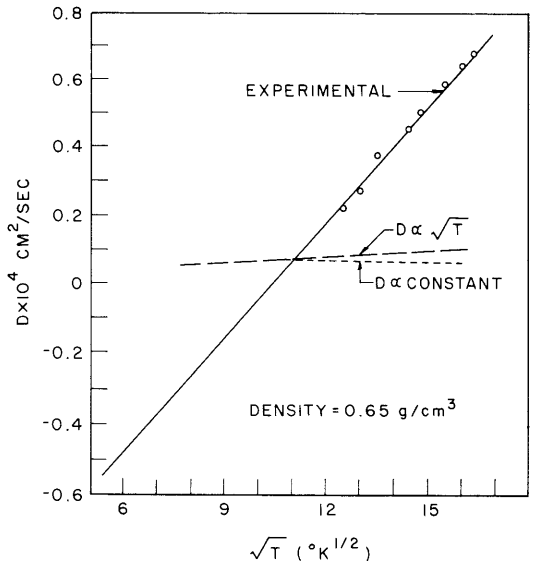

Fig. VIII-2. Experimental and theoretical values of D at constant volume.

representative results reduced to constant density. The circles are experimental points. The dotted and dashed lines show the predictions of the Doolittle[3] and of the Cohen-Turnbull[4] versions of free-volume theory, with the parameters that fit our previous measurements at constant pressure[2] used.

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References

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3. A. K. Doolittle, J. Appl. Phys. 22, 1471 (1951).
4. M. H. Cohen and D. Turnbull, J. Chem. Phys. 31, 1164 (1959).