

studied by Bridgman.<sup>2</sup> The viscosity of *n*-decane at 30° and 75°C through a pressure range of 6000 kg/cm<sup>2</sup> is included in this investigation. In addition to the viscosity measurements, the density-concentration data at 30°C and atmospheric pressure are recorded for completeness.

#### METHOD AND EXPERIMENTAL PROCEDURE

The method of preparing the mixtures was comparatively simple. The volume of each liquid was determined by a calibrated pipette which discharged between two graduations, and immediately after mixing, the density of the mixture at 30° was determined by a calibrated pycnometer which was fitted with ground glass caps to prevent evaporation.

The method employed in the viscosity measurements was that of Bridgman.<sup>2</sup> As the viscometer has been described previously,<sup>2, 3, 4</sup> it will suffice to recall the essentials of the instrument for the reader. It is of the falling-weight type consisting of a small cylindrical weight which is allowed to fall a few centimeters in a hollow steel cylinder of slightly larger internal diameter, the time of fall being measured electrically with a suitable timing device. In this way, the relative viscosity is measured by the time of fall. The time of fall could be found in opposite directions by enclosing the viscometer in a specially shaped pressure chamber which was connected to the remainder of the pressure apparatus in such a way that the whole assembly could be rotated through 180° by hand.

The pressure apparatus was of the type commonly used by Bridgman<sup>3</sup> in his investigations at high pressures, and was set up horizontally so that the viscometer could be rotated in a simple way. The pressures were determined as previously in this laboratory by measuring the changes of resistance of a manganin coil that was connected in the high pressure side of the press. The pressure chamber that contained the viscometer was surrounded by a constant temperature bath of water, the temperature being read on a corrected thermometer.

<sup>2</sup> P. W. Bridgman, *Physics of High Pressure*, Chap. 12, The Macmillan Co. (1931).

<sup>4</sup> E. Hatschek, *Viscosity of Liquids*, Chap. 6, Blackie and Sons (1928).

TABLE I. Densities,  $\zeta$  (in g/cm<sup>3</sup>) of mixtures of varying concentrations (in mole percent).

Conc.	Dens.	Conc.	Dens.	Conc.	Dens.	Conc.	Dens.
1. <i>n</i> -HEXANE CARBON DISULPHIDE		2. <i>n</i> -HEXANE DIETHYL ETHER		4. <i>n</i> -HEXANE CHLORO- BENZENE		5. <i>n</i> -PENTANE BENZENE	
31.8	0.959	0.0	0.701	49.0	0.851	43.8	0.748
58.2	0.802	33.1	0.682	75.5	0.975	11.5	0.837
41.1	0.890	28.3	0.685	34.0	0.787	66.2	0.693
20.2	1.043	35.4	0.679	63.0	0.914	82.4	0.657
13.4	1.110	41.8	0.673	100.0	1.098	28.0	0.787
4.9	1.190	79.8	0.662	88.4	1.042	52.3	0.725
0.0	1.244	49.7	0.673	17.6	0.722	75.1	0.672
82.9	0.702	16.5	0.692	94.6	1.074	100.0	0.617
46.4	0.856	75.5	0.662	5.1	0.678	0.0	0.869
41.1	0.890	84.1	0.659	1.8	0.667	59.2	0.707
73.5	0.738			97.3	1.087	36.2	0.765
65.1	0.771	3. <i>n</i> -HEXANE		90.0	1.050	19.8	0.809
54.7	0.816	<i>n</i> -DECANE		69.6	0.945	55.6	0.716
100.0	0.654	40.1	0.687	87.4	1.036		
				92.8	1.062	6. EUGENOL CARBON DISULPHIDE	
		100.0	0.727	96.4	1.082	10.5	1.194
		70.0	0.707			28.2	1.143
		28.6	0.680	91.5	1.056	54.1	1.097
		59.2	0.700	9.9	0.692	20.8	1.161
		85.7	0.717	3.5	0.670	43.9	1.116
		50.4	0.694	13.0	0.706	52.0	1.100
		19.7	0.673	7.6	0.684	0.0	1.244
		4.6	0.663	9.0	0.690	100.0	1.054
		13.5	0.670	95.0	1.076	69.2	1.078
		94.1	0.723	80.0	0.998	86.8	1.062
		77.0	0.712	3.0	0.669	33.9	1.130
		0.0	0.660	11.5	0.700	5.1	1.219
				0.0	0.660	80.0	1.067

#### DATA

The following six mixtures were studied through the entire range of concentration: *n*-hexane carbon disulphide, *n*-hexane diethyl ether, *n*-hexane *n*-decane, *n*-hexane chlorobenzene, *n*-pentane benzene, and eugenol carbon disulphide. Most of the liquids were of the best grade of Eastman and some were further purified by redistilling. Table I is a summary of the density data obtained as results of the pycnometer measurements.

The measured quantities for a viscosity determination were time of fall, pressure and temperature. The viscosity was computed from the time of fall by applying correction formulas<sup>2</sup> for the various errors caused by pressure effects. Following Bridgman, the common logarithm of the viscosity, instead of the viscosity itself, is given because of the very rapid increase of viscosity with increase of pressure. The viscosity of each mixture at atmospheric pressure at 30° was taken as unity, and the relative viscosity computed from  $\log_{10} t/t_0$ ,  $t$  being the corrected time of fall at a certain pressure and temperature, and  $t_0$  the time of fall at atmospheric pressure at 30°. The values of  $\log_{10} t/t_0$  at 30° and 75°,

TABLE  
Pressu  
(kg/c  
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4000  
6000  
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values