

TABLE I. Equilibrium dielectric constant as a function of temperature and pressure.

$T(^{\circ}\text{K}) \backslash P(\text{kbar})$	$\epsilon_0$								
	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
<i>n</i> -Propanol									
361.3	12.66	13.37	14.07	14.69	15.27	15.77	16.18	16.54	16.84
303.2	19.70	20.61	21.27	21.82	22.28	22.71	23.16	23.48	23.86
273.1	24.21	24.93	25.62	26.23	26.73	27.16	27.57	27.98	28.36
244.5	29.22	30.04	30.72	31.28	31.78	32.25	32.67	33.06	33.34
224.8	33.22	33.96	34.57	35.13	35.66	36.17	...	...	...
216.0	35.36	36.03	36.62	37.16	37.62	...	...	...	...
208.0	37.42	38.2	38.9	39.5	...	...	...	...	...
<i>sec</i> -Butanol									
367.9	7.01	8.21	8.93	9.51	9.98	10.33	10.68	10.99	11.29
325.3	11.75	12.54	13.20	13.74	14.22	14.66	15.10	15.50	15.85
307.1	14.85	16.00	16.82	17.50	18.03	18.49	18.90	19.27	19.62
272.5	21.15	22.03	22.74	23.20	23.76	24.14	24.49	24.81	25.12
247.1	26.38	27.09	27.70	28.19	28.60	29.01	29.37	29.66	...
221.0	32.52	33.11	33.60	34.04	34.42	34.68	...	...	...
6-Methyl-3-heptanol									
364.2	3.79	4.08	4.31	4.52	4.71	4.89	5.03	5.16	5.29
333.9	4.10	4.49	4.83	5.11	5.38	5.65	5.89	6.11	6.32
304.4	4.58	5.20	5.85	6.39	6.91	7.41	7.84	8.22	8.63
274.2	5.97	7.49	8.78	9.98	11.00	11.87	12.59	13.16	13.71
258.4	7.97	10.10	11.74	13.02	14.12	14.96	15.65	16.27	16.82
243.4	11.34	13.69	15.31	16.60	17.61	18.35	18.98	19.43	19.85
236.7	12.50	15.10	16.74	17.90	18.86	19.58	20.11	20.55	20.85
229.2	15.30	17.27	18.88	20.05	20.88	21.47	21.96	22.33	22.60
217.5	18.25	20.01	21.39	22.35	23.01	23.40	23.7	...	...

## Samples

Alcohols were reagent, or better, grade. 6-Methyl-3-heptanol (Chemical Samples Company) was 98% pure as received. Each alcohol was refluxed for several hours over  $\text{CaH}_2$  and then subjected to a careful fractionation. The GC analyses showed only trivial amounts of impurities.

1,2-Dichloroethane was chromatography (Matheson, Coleman and Bell) and was used without further purification. *n*-Butyl chloride (Fisher, certified quality) was fractionated before use. The density and index of refraction of both compounds agree well with literature values.

*n*-Hexane was Matheson, Coleman and Bell chromatography, (99.5+%; major impurity is methylcyclopropane) used without further purification after tests showed its dielectric constant to be the same as carefully dried, 99.9+% pure, samples. All of the

solvent for one solute came from the same lot of material.

Decalin (Distillation Products Industries, mixture of isomers) was distilled from  $\text{CaH}_2$ . Its density at  $27^{\circ}$  was 0.8820 g/ml;  $n_D^{25}=1.4727$ ;  $\epsilon_0(30^{\circ})=2.165$ .

## RESULTS

## Pure Alcohols

The equilibrium dielectric constant of *n*-propanol, *sec*-butanol, and 6-methyl-3-heptanol was measured as a function of pressure and temperature. Isothermal data were plotted on a large scale as a function of pressure. Interpolated data are listed in Table I. The only data available for comparison are Gilchrist, Earley, and Cole's<sup>9</sup> for *n*-propanol: our values of  $\epsilon_0$  at 1 kbar extrapolate to 43.8 at  $191^{\circ}\text{K}$  (their highest temperature), about 2% higher than their result. At

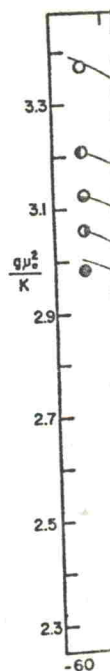


FIG. 1.  $\epsilon_0$  vs  $T$  for *n*-propanol.  $\circ$  = 1 kbar;  $\bullet$  = 2 kbar. Data from W. L. Le Mass, 1949;  $\circ$  = 1 atm (bottom insert) and G. Rinck, density data  $\bullet$ .

our lowest  $T$  became evident from which we basis of the extrapolate and Cole.

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Pertinent values are listed in