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Estimation of Refractive Index of Binary Liquid Mixtures of Dimethyl Carbonate and some Alcohols

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Abstract

Applicability of various empirical and semi-empirical rules to predict the refractive index of binary organic liquid mixtures is presented using some empirical and semi-empirical rules and their relative applicability. Binary mixtures of Dimethyl Carbonate and some Alcohols are chosen with a view to provide a large background of diversified experimental data. It has been found that any single formula is not applicable with same accuracy for every mixture and applicability varies according to the degree of molecular interaction taking place in the mixture.

Keywords: Refractive index, empirical rules, semi-empirical rules, liquid mixtures.

1. Introduction

Refractive index of a medium is a quantitative measure of the response of the medium to the electromagnetic radiation and is defined as the ratio of the velocity of the electromagnetic wave in vacuum to that in the medium for the given wavelength of the electromagnetic wave. For a given wavelength of light, refractive index is dependent on the nature of liquid, pressure and temperature. Refractive index is an important property of liquids and liquid mixtures and is often needed for many physico-chemical applications involving multiphase systems. Since refractive index is closely related with the orientation, ordering and strength of the constituent atomic oscillators of a given medium, it is expected that variation of refractive index of mixtures with temperature and composition can give valuable insight into the molecular rearrangement due to mixing.

Because of these factors, many workers [1-5] have measured the refractive index of pure liquids and binary liquid solutions. Since the rearrangement at the molecular level due to mixing causes definite contraction or/and expansion of the liquid, hence variation in density

is observed. As the variation of density produces a significant change in the refractive index, Laplace [6] made first attempt to connect the refractive index with the density. Gladstone-Dale in 1858 gave a simple formula for the estimation of refractive index of a binary mixture from the properties of the pure components. Various workers have made an attempt to scrutinize the relative merits of these mixing rules [7, 8, 9]. Aralguppi *et al.* [10] have measured densities and refractive indices of binary mixtures of methyl acetoacetate with benzene, toluene, m-xylene, mesitylene and anisole and have recommended the use of Eykman relation. Bhatia et al. [11] have applied these mixing rules for the binary mixture of (decane + benzne) and (hexadecane + benzene/hexane) over the entire composition range.

With this in view, it appeared important to scrutinize the relative merits of these mixing rules for the binary mixtures of alkanes and alcohols with some interactive components. The binary mixtures considered for investigation were, Dimethyl Carbonate (1) + Methanol (2), Dimethyl Carbonate (1) + Ethanol (2), Dimethyl Carbonate (1) + 1-Propanol (2), Dimethyl Carbonate (1) + 2-Propanol (2), Dimethyl Carbonate (1) + 1-Butanol (2), Dimethyl Carbonate (1) + 2-Butanol (2), Dimethyl Carbonate (1) + 1-Pentanol (2).

The refractive index and density of these mixtures at various temperatures have been taken from literature [12-14]. It is to be mentioned that Dimethyl carbonate will be abbreviated as DMC in the later discussion.

2. Theory

The various relations like, Gladstone-Dale relation (G-D) [15], Arago-Biot (A-B) [16], Wiener's relation (W) [11, 17] ,Heller's relation [11, 18], Lorentz-Lorenz (L-L) relation [19, 20], Eykman's (Eyk.) relation [10, 21], Oster's (Os) relation [11, 22], Newton's (Nn) [11, 23], have already been discussed in detail in our earlier paper [24].

Where the symbols used to describe the results M_i, ρ_i, n_i, ϕ_i, w_i and x_i, are molecular weight, density, refractive index, volume fraction, weight fraction and mole fraction of the i^{th} component (i = 1, 2 for binary mixture) respectively. ρ_m, n_m and V_m are respectively density, refractive index and molar volume of the mixture.

3. Results and Discussion

Experimental values of refractive index as well as those predicted by various mixing rules for above mentioned mixtures are Tables 1 to 7 respectively. Values of APD at various temperatures for all the relations are listed in Table 8.

A close perusal of the Tables 1 to 7 reveals that all the relations show good agreement with the corresponding experimental values of all the systems. Except ECA + Heptane mixture,

Newton's relation gives minimum average percentage deviation (APD) for all the mixtures, except a few exceptions, at all the three temperatures.

The variation of APD for various mixtures of ECA shows a haphazard fashion. For ECA +Hexane mixture, Newton relation gives the minimum value at all the three temperatures studied except at T=298 K when Oster's relation gives the minimum value. Gladstone-Dale equation at 298 K and Lorentz-Lorenz relation at other two temperatures gives maximum value of APD. ECA+Heptane mixture is unique in that for this mixture only Newton's relation gives a maximum value of APD. For All other mixtures of ECA, Newton's relation gives the minimum value of APD thereby indicating that it is the best choice. For all other mixtures of ECA, Arago-Biot relation gives the maximum value of the APD. Overall, values of APD for Heller's and Weiner's relations are very close to each other at all the three temperatures.

Except for the mixture with methanol, all other mixtures of DMC with alcohols give Arago Biot relation invariably gives maximum value of APD thereby indicating that it is not a good choice in anyway. It is also noteworthy that except few exceptions Newton's relation gives the minimum value of APD.DMC+1-pentanol mixture has significant variation in the minimum value of the APD which varies with temperature. Similar trend is shown for all the mixtures of DEC. DEC+methanol gives the maximum value of APD for the Heller's relation at all the four temperatures. For all other mixtures, Arago-Biot relation gives the maximum value of APD. The values of DEC+2-butanol are very high and makes it an unworthy choice for the estimation of the refractive index. Usually, Newton's relation and Oster's relation gives the best estimate as the value of APD is minimum for these relations, Although the occurrence of minimum value of APD is sensitive to the temperature and occurs for one relation at a temperature and occurs for another relation when temperature is raised.

Again, the temperature dependence is not very systematic for any mixture studied here. For mixtures with ECA, APD increases when the temperature is raised from 298K to 303K but again falls with further increase in temperature from T=303 K to 308 K. Similarly, value of APD increases when temperature is raised from 293K to 298 K but falls again and then rises when the temperature is raised from 298 K to 303 K and then to 308 K for DMC + alcohols and DEC+ alcohols mixtures.

4. Conclusion

The present chapter reports an attempt to study the validity of eight mixing rules for the prediction of refractive index of binary mixtures. Temperature dependence of these relations

has been analyzed. It is concluded that the theoretical mixing rules are inter-related and perform well within the limits of experimental error. Since mixtures of liquids with different nature and molecular size were considered, a particular relation provides excellent agreement in some systems but deviates in others [8, 10, 11].

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Table 1. Refractive index of (Dimethyl Carbonate (1) + methanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
				T = 293.15 K					
0.0000	1.32843	1.32843	1.32843	1.32824	1.32843	1.32843	1.32843	1.32843	1.32843
0.0537	1.33300	1.33271	1.33292	1.33247	1.33262	1.33267	1.33270	1.33274	1.33276
0.0996	1.33636	1.33608	1.33662	1.33573	1.33585	1.33602	1.33606	1.33611	1.33615
0.2058	1.34325	1.34271	1.34357	1.34227	1.34235	1.34262	1.34268	1.34276	1.34280
0.3135	1.34870	1.34825	1.34932	1.34776	1.34781	1.34816	1.34822	1.34831	1.34835
0.4100	1.35305	1.35240	1.35347	1.35193	1.35196	1.35231	1.35237	1.35245	1.35249
0.5086	1.35664	1.35603	1.35698	1.35562	1.35564	1.35595	1.35600	1.35608	1.35611
0.6104	1.35993	1.35925	1.36002	1.35892	1.35894	1.35919	1.35923	1.35929	1.35932
0.7229	1.36320	1.36235	1.36292	1.36210	1.36211	1.36230	1.36233	1.36237	1.36239
0.8338	1.36574	1.36496	1.36523	1.36484	1.36484	1.36493	1.36495	1.36498	1.36499
0.9067	1.36718	1.36648	1.36653	1.36646	1.36646	1.36646	1.36648	1.36650	1.36651
0.9509	1.36787	1.36737	1.36732	1.36738	1.36738	1.36735	1.36736	1.36737	1.36738
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835
				T = 303.15 K					
0.0000	1.32410	1.32410	1.32410	1.32391	1.32410	1.32410	1.32410	1.32410	1.32410
0.0260	1.32646	1.32635	1.32678	1.32601	1.32618	1.32633	1.32634	1.32636	1.32636

0.0707	1.33003	1.32983	1.33063	1.32938	1.32952	1.32980	1.32982	1.32986	1.32987
0.1832	1.33761	1.33722	1.33835	1.33668	1.33677	1.33715	1.33720	1.33727	1.33730
0.2839	1.34310	1.34262	1.34385	1.34207	1.34213	1.34253	1.34259	1.34268	1.34272
0.3823	1.34749	1.34707	1.34830	1.34654	1.34657	1.34698	1.34704	1.34712	1.34716
0.4869	1.35145	1.35106	1.35213	1.35060	1.35063	1.35098	1.35103	1.35111	1.35114
0.5847	1.35460	1.35427	1.35518	1.35389	1.35391	1.35421	1.35425	1.35431	1.35434
0.6832	1.35748	1.35708	1.35772	1.35681	1.35681	1.35702	1.35706	1.35711	1.35713
0.8119	1.36053	1.36024	1.36055	1.36011	1.36011	1.36020	1.36023	1.36026	1.36028
0.8969	1.36236	1.36211	1.36228	1.36203	1.36203	1.36209	1.36210	1.36212	1.36213
0.9581	1.36338	1.36333	1.36339	1.36331	1.36331	1.36333	1.36333	1.36334	1.36334
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414
				T = 313.15 K					
0.0000	1.32048	1.32048	1.32048	1.32030	1.32048	1.32048	1.32048	1.32048	1.32048
0.0648	1.32527	1.32532	1.32513	1.32523	1.32537	1.32526	1.32529	1.32535	1.32539
0.1008	1.32776	1.32785	1.32791	1.32769	1.32780	1.32778	1.32782	1.32789	1.32793
0.1978	1.33385	1.33378	1.33416	1.33353	1.33361	1.33368	1.33375	1.33384	1.33389
0.3027	1.33922	1.33908	1.33955	1.33882	1.33887	1.33897	1.33904	1.33914	1.33920
0.3928	1.34318	1.34295	1.34345	1.34269	1.34272	1.34284	1.34291	1.34300	1.34306
0.4855	1.34668	1.34641	1.34697	1.34615	1.34617	1.34632	1.34638	1.34646	1.34651
0.5738	1.34953	1.34929	1.34979	1.34906	1.34907	1.34921	1.34926	1.34933	1.34937
0.7009	1.35289	1.35284	1.35319	1.35268	1.35269	1.35278	1.35282	1.35287	1.35290
0.7838	1.35481	1.35487	1.35514	1.35476	1.35476	1.35483	1.35486	1.35490	1.35492
0.9029	1.35748	1.35748	1.35767	1.35740	1.35740	1.35747	1.35748	1.35749	1.35750
0.9283	1.35746	1.35796	1.35804	1.35792	1.35792	1.35795	1.35796	1.35797	1.35798
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index.

Table 2. Refractive index of (Dimethyl Carbonate (1) + ethanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
				T = 293.15 K					
0.0000	1.36125	1.36125	1.36125	1.36124	1.36125	1.36125	1.36125	1.36125	1.36125
0.0498	1.36197	1.36155	1.36101	1.36175	1.36175	1.36153	1.36154	1.36156	1.36158
0.0978	1.36238	1.36187	1.36093	1.36221	1.36222	1.36183	1.36185	1.36189	1.36192
0.1760	1.36297	1.36231	1.36063	1.36293	1.36293	1.36224	1.36228	1.36234	1.36240
0.2928	1.36386	1.36314	1.36102	1.36391	1.36391	1.36304	1.36309	1.36317	1.36324
0.4053	1.36459	1.36395	1.36170	1.36478	1.36478	1.36385	1.36390	1.36398	1.36406
0.4981	1.36527	1.36459	1.36229	1.36544	1.36544	1.36449	1.36454	1.36463	1.36471
0.5982	1.36602	1.36525	1.36296	1.36610	1.36610	1.36515	1.36521	1.36529	1.36537
0.6962	1.36671	1.36589	1.36366	1.36670	1.36670	1.36579	1.36584	1.36592	1.36600
0.8024	1.36751	1.36661	1.36468	1.36732	1.36732	1.36652	1.36657	1.36664	1.36670
0.8894	1.36806	1.36732	1.36605	1.36779	1.36779	1.36726	1.36729	1.36734	1.36738
0.9516	1.36836	1.36785	1.36715	1.36811	1.36811	1.36782	1.36784	1.36786	1.36789
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835
				T = 298.15 K					
0.0000	1.35922	1.35922	1.35922	1.35921	1.35922	1.35922	1.35922	1.35922	1.35922
0.0598	1.35970	1.35959	1.35893	1.35982	1.35983	1.35956	1.35958	1.35960	1.35962
0.0950	1.35998	1.35983	1.35890	1.36017	1.36017	1.35979	1.35981	1.35985	1.35988
0.1692	1.36054	1.36034	1.35893	1.36085	1.36086	1.36028	1.36031	1.36036	1.36041
0.2725	1.36128	1.36110	1.35932	1.36174	1.36175	1.36102	1.36106	1.36113	1.36119
0.3854	1.36204	1.36190	1.35988	1.36264	1.36264	1.36181	1.36186	1.36193	1.36200

0.4778	1.36266	1.36253	1.36038	1.36331	1.36331	1.36243	1.36248	1.36256	1.36263
0.5686	1.36325	1.36314	1.36100	1.36393	1.36393	1.36305	1.36310	1.36318	1.36325
0.6777	1.36400	1.36389	1.36187	1.36462	1.36462	1.36380	1.36384	1.36392	1.36399
0.7915	1.36478	1.36467	1.36297	1.36529	1.36529	1.36460	1.36464	1.36470	1.36476
0.8775	1.36541	1.36533	1.36412	1.36577	1.36577	1.36527	1.36530	1.36534	1.36539
0.9366	1.36589	1.36582	1.36513	1.36608	1.36608	1.36579	1.36581	1.36583	1.36586
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
T = 303.15 K									
0.0000	1.35680	1.35680	1.35680	1.35674	1.35680	1.35680	1.35680	1.35680	1.35680
0.0673	1.35912	1.35857	1.35739	1.35896	1.35901	1.35851	1.35854	1.35860	1.35864
0.1142	1.36116	1.35983	1.35809	1.36043	1.36048	1.35973	1.35978	1.35986	1.35993
0.2249	1.36463	1.36274	1.36018	1.36367	1.36370	1.36259	1.36267	1.36279	1.36290
0.2894	1.36744	1.36437	1.36153	1.36541	1.36544	1.36421	1.36430	1.36444	1.36456
0.3906	1.36979	1.36691	1.36401	1.36798	1.36800	1.36674	1.36683	1.36698	1.36710
0.4848	1.37188	1.36923	1.36661	1.37019	1.37020	1.36907	1.36916	1.36929	1.36940
0.5996	1.37385	1.37187	1.36964	1.37269	1.37270	1.37173	1.37181	1.37192	1.37202
0.6931	1.37557	1.37386	1.37191	1.37459	1.37459	1.37374	1.37381	1.37391	1.37399
0.8038	1.37705	1.37614	1.37470	1.37668	1.37668	1.37605	1.37610	1.37618	1.37624
0.9072	0.37860	1.37815	1.37721	1.37850	1.37850	1.37809	1.37812	1.37817	1.37821
0.9462	1.37903	1.37892	1.37829	1.37916	1.37916	1.37888	1.37890	1.37893	1.37896
1.0000	1.38004	1.38004	1.38004	1.38004	1.38004	1.38004	1.38004	1.38004	1.38004
T = 313.15 K									
0.0000	1.35303	1.35303	1.35303	1.35303	1.35303	1.35303	1.35303	1.35303	1.35303
0.0504	1.35307	1.35287	1.35115	1.35348	1.35349	1.35280	1.35284	1.35289	1.35295
0.0934	1.35323	1.35288	1.35013	1.35386	1.35386	1.35277	1.35282	1.35291	1.35300
0.2082	1.35387	1.35317	1.34868	1.35478	1.35478	1.35299	1.35308	1.35323	1.35338
0.3087	1.35445	1.35371	1.34867	1.35552	1.35552	1.35351	1.35361	1.35378	1.35395
0.3930	1.35496	1.35431	1.34937	1.35609	1.35609	1.35411	1.35422	1.35438	1.35455
0.5026	1.35562	1.35526	1.35103	1.35677	1.35678	1.35509	1.35517	1.35532	1.35546
0.6011	1.35626	1.35606	1.35248	1.35735	1.35735	1.35592	1.35599	1.35611	1.35623
0.7052	1.35689	1.35689	1.35402	1.35791	1.35791	1.35677	1.35683	1.35693	1.35702
0.7968	1.35750	1.35767	1.35571	1.35838	1.35838	1.35759	1.35764	1.35770	1.35777
0.9075	1.35830	1.35857	1.35764	1.35891	1.35891	1.35853	1.35855	1.35858	1.35862
0.9507	1.35881	1.35892	1.35842	1.35910	1.35910	1.35890	1.35891	1.35893	1.35895
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index.

Table 3. Refractive index of (Dimethyl Carbonate (1) + 1-propanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
T = 293.15 K									
0.0000	1.38307	1.38307	1.38307	1.38304	1.38307	1.38307	1.28966	1.29629	1.38307
0.0517	1.38166	1.38164	1.38043	1.38205	1.38208	1.38158	1.29368	1.30004	1.38171
0.0898	1.38078	1.38069	1.37884	1.38134	1.38137	1.38060	1.29669	1.30283	1.38080
0.1903	1.37848	1.37837	1.37521	1.37951	1.37953	1.37821	1.30459	1.31015	1.37856
0.2896	1.37642	1.37630	1.37229	1.37775	1.37777	1.37610	1.31234	1.31731	1.37653
0.3944	1.37438	1.37428	1.36969	1.37595	1.37596	1.37405	1.32041	1.32473	1.37454
0.4980	1.37264	1.37252	1.36784	1.37422	1.37422	1.37229	1.32837	1.33201	1.37278
0.5993	1.37107	1.37093	1.36644	1.37256	1.37257	1.37071	1.33606	1.33902	1.37118
0.7016	1.36961	1.36951	1.36557	1.37094	1.37094	1.36932	1.34380	1.34605	1.36972
0.8007	1.36842	1.36826	1.36515	1.36940	1.36940	1.36812	1.35126	1.35279	1.36843
0.8994	1.36741	1.36720	1.36530	1.36790	1.36790	1.36712	1.35869	1.35948	1.36731

0.9490	1.36690	1.36674	1.36561	1.36716	1.36716	1.36669	1.36244	1.36285	1.36680
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
T = 298.15 K									
0.0000	1.38307	1.38307	1.38307	1.38304	1.38307	1.38307	1.28966	1.29629	1.38307
0.0517	1.38166	1.38164	1.38043	1.38205	1.38208	1.38158	1.29368	1.30004	1.38171
0.0898	1.38078	1.38069	1.37884	1.38134	1.38137	1.38060	1.29669	1.30283	1.38080
0.1903	1.37848	1.37837	1.37521	1.37951	1.37953	1.37821	1.30459	1.31015	1.37856
0.2896	1.37642	1.37630	1.37229	1.37775	1.37777	1.37610	1.31234	1.31731	1.37653
0.3944	1.37438	1.37428	1.36969	1.37595	1.37596	1.37405	1.32041	1.32473	1.37454
0.4980	1.37264	1.37252	1.36784	1.37422	1.37422	1.37229	1.32837	1.33201	1.37278
0.5993	1.37107	1.37093	1.36644	1.37256	1.37257	1.37071	1.33606	1.33902	1.37118
0.7016	1.36961	1.36951	1.36557	1.37094	1.37094	1.36932	1.34380	1.34605	1.36972
0.8007	1.36842	1.36826	1.36515	1.36940	1.36940	1.36812	1.35126	1.35279	1.36843
0.8994	1.36741	1.36720	1.36530	1.36790	1.36790	1.36712	1.35869	1.35948	1.36731
0.9490	1.36690	1.36674	1.36561	1.36716	1.36716	1.36669	1.36244	1.36285	1.36680
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
T = 303.15 K									
0.0000	1.38104	1.38104	1.38104	1.38100	1.38104	1.38104	1.38104	1.38104	1.38104
0.0728	1.37904	1.37861	1.37585	1.37959	1.37962	1.37848	1.37855	1.37866	1.37876
0.0829	1.37878	1.37828	1.37514	1.37939	1.37942	1.37813	1.37821	1.37834	1.37845
0.1840	1.37647	1.37557	1.37018	1.37751	1.37753	1.37531	1.37545	1.37567	1.37587
0.2605	1.37493	1.37390	1.36771	1.37613	1.37615	1.37360	1.37376	1.37401	1.37424
0.3758	1.37273	1.37173	1.36514	1.37411	1.37412	1.37142	1.37159	1.37185	1.37209
0.4849	1.37068	1.37001	1.36377	1.37226	1.37227	1.36971	1.36987	1.37012	1.37035
0.6278	1.36839	1.36802	1.36279	1.36991	1.36992	1.36777	1.36791	1.36811	1.36831
0.7071	1.36721	1.36708	1.36276	1.36865	1.36865	1.36688	1.36699	1.36716	1.36732
0.8061	1.36590	1.36592	1.36268	1.36709	1.36709	1.36577	1.36585	1.36597	1.36609
0.9018	1.36481	1.36497	1.36318	1.36562	1.36562	1.36489	1.36493	1.36500	1.36507
0.9507	1.36439	1.36455	1.36365	1.36488	1.36488	1.36451	1.36453	1.36457	1.36460
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414
T = 313.15 K									
0.0000	1.38104	1.38104	1.38104	1.38100	1.38104	1.38104	1.38104	1.38104	1.38104
0.0728	1.37904	1.37861	1.37585	1.37959	1.37962	1.37848	1.37855	1.37866	1.37876
0.0829	1.37878	1.37828	1.37514	1.37939	1.37942	1.37813	1.37821	1.37834	1.37845
0.1840	1.37647	1.37557	1.37018	1.37751	1.37753	1.37531	1.37545	1.37567	1.37587
0.2605	1.37493	1.37390	1.36771	1.37613	1.37615	1.37360	1.37376	1.37401	1.37424
0.3758	1.37273	1.37173	1.36514	1.37411	1.37412	1.37142	1.37159	1.37185	1.37209
0.4849	1.37068	1.37001	1.36377	1.37226	1.37227	1.36971	1.36987	1.37012	1.37035
0.6278	1.36839	1.36802	1.36279	1.36991	1.36992	1.36777	1.36791	1.36811	1.36831
0.7071	1.36721	1.36708	1.36276	1.36865	1.36865	1.36688	1.36699	1.36716	1.36732
0.8061	1.36590	1.36592	1.36268	1.36709	1.36709	1.36577	1.36585	1.36597	1.36609
0.9018	1.36481	1.36497	1.36318	1.36562	1.36562	1.36489	1.36493	1.36500	1.36507
0.9507	1.36439	1.36455	1.36365	1.36488	1.36488	1.36451	1.36453	1.36457	1.36460
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414

*Experimental value of refractive index.

Table 4. Refractive index of (Dimethyl Carbonate (1) + 2-propanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn

T = 293.15 K

0.0000	1.37702	1.37702	1.37702	1.37701	1.37702	1.37702	1.37702	1.37702	1.37702
0.0526	1.37628	1.37604	1.37478	1.37650	1.37651	1.37599	1.37602	1.37607	1.37611
0.0934	1.37559	1.37534	1.37322	1.37611	1.37612	1.37524	1.37529	1.37537	1.37545
0.2033	1.37410	1.37366	1.36976	1.37509	1.37509	1.37348	1.37357	1.37372	1.37386
0.3129	1.37275	1.37231	1.36746	1.37409	1.37410	1.37209	1.37221	1.37239	1.37256
0.4065	1.37171	1.37135	1.36615	1.37326	1.37327	1.37111	1.37124	1.37143	1.37162
0.5000	1.37089	1.37046	1.36505	1.37245	1.37245	1.37022	1.37035	1.37055	1.37074
0.6079	1.37008	1.36961	1.36439	1.37153	1.37154	1.36938	1.36950	1.36970	1.36988
0.7026	1.36953	1.36904	1.36440	1.37074	1.37075	1.36883	1.36894	1.36911	1.36928
0.8048	1.36908	1.36846	1.36453	1.36991	1.36991	1.36829	1.36838	1.36852	1.36866
0.9008	1.36873	1.36827	1.36591	1.36914	1.36914	1.36816	1.36822	1.36830	1.36839
0.9507	1.36866	1.36826	1.36697	1.36874	1.36874	1.36821	1.36824	1.36828	1.36833
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835

T = 298.15 K

0.0000	1.37521	1.37521	1.37521	1.37520	1.37521	1.37521	1.37521	1.37521	1.37521
0.0498	1.37425	1.37415	1.37262	1.37471	1.37472	1.37408	1.37412	1.37418	1.37423
0.0979	1.37344	1.37331	1.37076	1.37424	1.37425	1.37320	1.37326	1.37335	1.37345
0.2031	1.37177	1.37167	1.36735	1.37324	1.37325	1.37147	1.37157	1.37174	1.37189
0.2999	1.37070	1.37038	1.36500	1.37235	1.37235	1.37014	1.37027	1.37047	1.37066
0.9720	1.36958	1.31047	1.15729	1.36659	1.36659	1.30522	1.30778	1.31219	1.31710
0.4892	1.36882	1.36850	1.36259	1.37066	1.37066	1.36823	1.36837	1.36859	1.36880
0.5938	1.36802	1.36764	1.36185	1.36975	1.36975	1.36738	1.36751	1.36773	1.36793
0.6971	1.36735	1.36696	1.36172	1.36888	1.36888	1.36673	1.36685	1.36704	1.36723
0.7983	1.36687	1.36656	1.36254	1.36804	1.36804	1.36639	1.36648	1.36662	1.36677
0.9012	1.36658	1.36624	1.36362	1.36719	1.36719	1.36612	1.36618	1.36628	1.36637
0.9451	1.36658	1.36627	1.36470	1.36684	1.36684	1.36620	1.36623	1.36629	1.36635
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640

T = 303.15 K

0.0000	1.37261	1.37261	1.37261	1.37260	1.37261	1.37261	1.37261	1.37261	1.37261
0.0437	1.37185	1.37204	1.37160	1.37219	1.37220	1.37202	1.37203	1.37205	1.37206
0.1028	1.37083	1.37095	1.36904	1.37164	1.37165	1.37087	1.37091	1.37098	1.37105
0.2013	1.36935	1.36937	1.36559	1.37074	1.37074	1.36920	1.36929	1.36943	1.36956
0.3062	1.36810	1.36802	1.36310	1.36980	1.36981	1.36780	1.36792	1.36810	1.36827
0.3840	1.36726	1.36717	1.36176	1.36913	1.36913	1.36693	1.36705	1.36725	1.36744
0.4951	1.36619	1.36615	1.36054	1.36818	1.36819	1.36590	1.36603	1.36623	1.36643
0.5998	1.36530	1.36533	1.35985	1.36731	1.36732	1.36509	1.36521	1.36541	1.36560
0.7053	1.36451	1.36476	1.36009	1.36646	1.36646	1.36456	1.36466	1.36483	1.36499
0.8047	1.36411	1.36434	1.36069	1.36566	1.36566	1.36418	1.36426	1.36439	1.36452
0.9062	1.36388	1.36416	1.36221	1.36487	1.36487	1.36407	1.36412	1.36419	1.36425
0.9370	1.36390	1.36411	1.36270	1.36463	1.36463	1.36405	1.36408	1.36413	1.36418
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414

T = 313.15 K

0.0000	1.36821	1.36821	1.36821	1.36820	1.36821	1.36821	1.36821	1.36821	1.36821
0.0507	1.36705	1.36685	1.36450	1.36769	1.36769	1.36675	1.36680	1.36689	1.36697
0.0997	1.36627	1.36576	1.36173	1.36720	1.36721	1.36559	1.36568	1.36582	1.36596
0.1984	1.36459	1.36398	1.35765	1.36625	1.36626	1.36371	1.36385	1.36408	1.36430
0.2975	1.36316	1.36273	1.35550	1.36533	1.36533	1.36243	1.36259	1.36284	1.36309
0.4001	1.36205	1.36170	1.35417	1.36440	1.36440	1.36138	1.36154	1.36181	1.36207
0.4884	1.36121	1.36093	1.35344	1.36361	1.36361	1.36061	1.36077	1.36104	1.36129
0.5959	1.36029	1.36022	1.35339	1.36268	1.36268	1.35994	1.36009	1.36032	1.36056
0.7017	1.35964	1.35967	1.35381	1.36177	1.36178	1.35942	1.35955	1.35975	1.35996

0.8014	1.35923	1.35936	1.35496	1.36094	1.36094	1.35918	1.35927	1.35942	1.35958
0.9053	1.35893	1.35919	1.35670	1.36009	1.36009	1.35909	1.35914	1.35923	1.35931
0.9492	1.35916	1.35919	1.35768	1.35973	1.35973	1.35913	1.35916	1.35921	1.35926
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index.

Table 5. Refractive index of (Dimethyl Carbonate (1)+1-butanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
				T = 293.15 K					
0.0000	1.39924	1.39924	1.39924	1.39912	1.39924	1.39924	1.39924	1.39924	1.39924
0.0158	1.39733	1.40257	1.41205	1.39896	1.39908	1.40307	1.40279	1.40239	1.40203
0.0975	1.39569	1.39566	1.39368	1.39628	1.39638	1.39553	1.39561	1.39571	1.39580
0.1961	1.39235	1.39213	1.38845	1.39339	1.39347	1.39190	1.39203	1.39222	1.39239
0.3164	1.38871	1.38707	1.37951	1.38977	1.38982	1.38663	1.38687	1.38724	1.38755
0.4108	1.38540	1.38517	1.38000	1.38700	1.38704	1.38484	1.38503	1.38530	1.38553
0.4769	1.38338	1.38310	1.37778	1.38499	1.38503	1.38277	1.38296	1.38324	1.38347
0.6101	1.37936	1.37902	1.37380	1.38090	1.38092	1.37870	1.37888	1.37915	1.37938
0.7043	1.37675	1.37628	1.37165	1.37795	1.37796	1.37600	1.37615	1.37639	1.37659
0.8043	1.37383	1.37347	1.36991	1.37476	1.37477	1.37326	1.37338	1.37356	1.37371
0.9052	1.37111	1.37069	1.36851	1.37149	1.37149	1.37057	1.37064	1.37074	1.37084
0.9508	1.36984	1.36953	1.36827	1.36999	1.36999	1.36946	1.36950	1.36956	1.36961
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835
				T = 298.15 K					
0.0000	1.39702	1.39702	1.39702	1.39690	1.39702	1.39702	1.39702	1.39702	1.39702
0.0527	1.39530	1.39492	1.39337	1.39537	1.39548	1.39482	1.39488	1.39495	1.39502
0.1009	1.39362	1.39313	1.39055	1.39397	1.39407	1.39297	1.39306	1.39319	1.39330
0.2002	1.39014	1.38959	1.38527	1.39108	1.39115	1.38933	1.38948	1.38970	1.38988
0.2986	1.38688	1.38632	1.38098	1.38819	1.38825	1.38599	1.38618	1.38645	1.38668
0.3974	1.38369	1.38323	1.37750	1.38526	1.38531	1.38289	1.38308	1.38337	1.38362
0.5039	1.38031	1.37994	1.37397	1.38206	1.38209	1.37958	1.37978	1.38008	1.38033
0.6008	1.37739	1.37705	1.37131	1.37910	1.37912	1.37671	1.37690	1.37719	1.37743
0.7028	1.37442	1.37409	1.36892	1.37594	1.37596	1.37379	1.37395	1.37421	1.37442
0.8011	1.37165	1.37141	1.36741	1.37285	1.37285	1.37118	1.37131	1.37150	1.37167
0.8965	1.36918	1.36887	1.36634	1.36979	1.36979	1.36873	1.36881	1.36893	1.36903
0.9503	1.36778	1.36749	1.36600	1.36804	1.36804	1.36741	1.36746	1.36753	1.36759
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
				T = 303.15 K					
0.0000	1.39521	1.39521	1.39521	1.39509	1.39521	1.39521	1.39521	1.39521	1.39521
0.0249	1.39432	1.39427	1.39369	1.39436	1.39447	1.39423	1.39425	1.39428	1.39431
0.0960	1.39157	1.39156	1.38933	1.39226	1.39236	1.39142	1.39150	1.39162	1.39171
0.1911	1.38817	1.38818	1.38441	1.38945	1.38953	1.38794	1.38808	1.38827	1.38843
0.2998	1.38441	1.38449	1.37952	1.38621	1.38627	1.38418	1.38435	1.38461	1.38483
0.3877	1.38149	1.38167	1.37626	1.38357	1.38361	1.38134	1.38153	1.38180	1.38204
0.4799	1.37846	1.37879	1.37318	1.38076	1.38079	1.37844	1.37864	1.37892	1.37916
0.5865	1.37524	1.37556	1.37017	1.37747	1.37749	1.37523	1.37542	1.37569	1.37592
0.6907	1.37215	1.37248	1.36766	1.37420	1.37421	1.37220	1.37236	1.37260	1.37281
0.7931	1.36933	1.36959	1.36581	1.37093	1.37094	1.36937	1.36949	1.36967	1.36984
0.8925	1.36670	1.36690	1.36466	1.36770	1.36771	1.36677	1.36685	1.36695	1.36705
0.9464	1.36542	1.36552	1.36440	1.36593	1.36593	1.36546	1.36549	1.36555	1.36560
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414

T = 313.15 K									
0.0000	1.39090	1.39090	1.39090	1.39077	1.39090	1.39090	1.39090	1.39090	1.39090
0.0499	1.38897	1.38878	1.38709	1.38927	1.38938	1.38868	1.38874	1.38882	1.38889
0.0998	1.38714	1.38673	1.38354	1.38776	1.38786	1.38654	1.38664	1.38680	1.38693
0.2234	1.38282	1.38202	1.37621	1.38402	1.38409	1.38169	1.38188	1.38215	1.38239
0.3000	1.38005	1.37937	1.37265	1.38169	1.38175	1.37898	1.37920	1.37951	1.37979
0.3991	1.37681	1.37606	1.36862	1.37865	1.37870	1.37564	1.37587	1.37622	1.37653
0.5054	1.37316	1.37273	1.36521	1.37536	1.37540	1.37231	1.37254	1.37289	1.37320
0.6030	1.37021	1.36984	1.36284	1.37230	1.37232	1.36945	1.36966	1.36999	1.37028
0.6904	1.36756	1.36734	1.36117	1.36952	1.36953	1.36700	1.36719	1.36748	1.36773
0.8009	1.36436	1.36430	1.35963	1.36595	1.36595	1.36405	1.36418	1.36440	1.36459
0.9014	1.36165	1.36171	1.35910	1.36264	1.36264	1.36157	1.36165	1.36177	1.36187
0.9471	1.36053	1.36059	1.35912	1.36111	1.36111	1.36051	1.36055	1.36062	1.36068
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index.

Table 6. Refractive index of (Dimethyl Carbonate (1)+2-butanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
T = 293.15 K									
0.0000	1.39722	1.39722	1.39722	1.39712	1.39722	1.39722	1.39722	1.39722	1.39722
0.0505	1.39542	1.39508	1.39308	1.39572	1.39582	1.39497	1.39503	1.39513	1.39521
0.0986	1.39370	1.39321	1.38972	1.39440	1.39449	1.39301	1.39312	1.39329	1.39343
0.2131	1.38975	1.38912	1.38309	1.39125	1.39132	1.38877	1.38897	1.38925	1.38950
0.2801	1.38757	1.38690	1.37990	1.38940	1.38946	1.38650	1.38672	1.38705	1.38734
0.4092	1.38360	1.38288	1.37477	1.38580	1.38584	1.38242	1.38268	1.38305	1.38338
0.5110	1.38058	1.37992	1.37165	1.38292	1.38294	1.37947	1.37972	1.38010	1.38044
0.6172	1.37760	1.37702	1.36917	1.37987	1.37988	1.37659	1.37683	1.37718	1.37750
0.7072	1.37530	1.37474	1.36786	1.37724	1.37725	1.37436	1.37457	1.37488	1.37515
0.7997	1.37312	1.37247	1.36694	1.37449	1.37449	1.37218	1.37234	1.37258	1.37280
0.8229	1.37244	1.37195	1.36690	1.37379	1.37379	1.37168	1.37183	1.37205	1.37225
0.9518	1.36951	1.36919	1.36737	1.36985	1.36985	1.36910	1.36915	1.36922	1.36929
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835
T = 298.15 K									
0.0000	1.39523	1.39523	1.39523	1.39513	1.39523	1.39523	1.39523	1.39523	1.39523
0.0572	1.39285	1.39281	1.39052	1.39355	1.39364	1.39268	1.39275	1.39286	1.39295
0.0994	1.39120	1.39115	1.38750	1.39239	1.39247	1.39094	1.39106	1.39123	1.39137
0.1958	1.38769	1.38768	1.38182	1.38974	1.38981	1.38735	1.38753	1.38781	1.38804
0.3029	1.38413	1.38413	1.37668	1.38678	1.38684	1.38371	1.38395	1.38429	1.38459
0.3339	1.38308	1.38315	1.37539	1.38592	1.38597	1.38272	1.38296	1.38332	1.38363
0.5075	1.37792	1.37798	1.36948	1.38104	1.38107	1.37751	1.37777	1.37816	1.37850
0.6051	1.37535	1.37530	1.36715	1.37824	1.37826	1.37486	1.37510	1.37547	1.37579
0.7037	1.37271	1.37276	1.36555	1.37537	1.37538	1.37238	1.37259	1.37291	1.37319
0.8080	1.37033	1.37019	1.36446	1.37227	1.37228	1.36990	1.37006	1.37031	1.37053
0.9046	1.36814	1.36817	1.36490	1.36935	1.36935	1.36800	1.36809	1.36823	1.36836
0.9523	1.36733	1.36723	1.36544	1.36788	1.36788	1.36714	1.36719	1.36727	1.36734
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
T = 303.15 K									
0.0000	1.39288	1.39288	1.39288	1.39278	1.39288	1.39288	1.39288	1.39288	1.39288
0.0573	1.39046	1.39056	1.38852	1.39121	1.39130	1.39045	1.39051	1.39061	1.39069
0.0842	1.38942	1.38949	1.38654	1.39047	1.39055	1.38932	1.38942	1.38955	1.38967

0.1936	1.38534	1.37169	1.33045	1.38663	1.38670	1.36975	1.37079	1.37239	1.37390
0.2981	1.38198	1.38200	1.37469	1.38459	1.38464	1.38160	1.38182	1.38215	1.38245
0.3926	1.37902	1.37901	1.37076	1.38196	1.38200	1.37856	1.37881	1.37919	1.37952
0.4938	1.37605	1.37607	1.36759	1.37911	1.37914	1.37562	1.37587	1.37625	1.37659
0.5900	1.37337	1.37346	1.36534	1.37637	1.37639	1.37302	1.37326	1.37362	1.37395
0.6561	1.37161	1.37171	1.36406	1.37446	1.37447	1.37131	1.37153	1.37187	1.37217
0.7945	1.36832	1.36837	1.36275	1.37039	1.37040	1.36808	1.36824	1.36848	1.36870
0.8916	1.36613	1.36630	1.36304	1.36747	1.36748	1.36613	1.36622	1.36636	1.36649
0.9483	1.36516	1.36514	1.36346	1.36574	1.36574	1.36505	1.36510	1.36517	1.36523
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414
				T = 313.15 K					
0.0000	1.38818	1.38818	1.38818	1.38808	1.38818	1.38818	1.38818	1.38818	1.38818
0.0498	1.38307	1.38589	1.38342	1.38668	1.38678	1.38576	1.38584	1.38594	1.38604
0.1005	1.38398	1.38370	1.37906	1.38527	1.38536	1.38346	1.38359	1.38379	1.38397
0.2009	1.38030	1.37987	1.37234	1.38250	1.38256	1.37948	1.37970	1.38002	1.38032
0.2952	1.37715	1.37664	1.36741	1.37988	1.37994	1.37616	1.37643	1.37682	1.37718
0.4047	1.37370	1.37324	1.36308	1.37683	1.37687	1.37272	1.37300	1.37344	1.37383
0.5109	1.37058	1.37029	1.36029	1.37383	1.37386	1.36978	1.37006	1.37048	1.37087
0.6072	1.36799	1.36772	1.35824	1.37108	1.37109	1.36724	1.36750	1.36789	1.36826
0.6982	1.36565	1.36550	1.35723	1.36843	1.36844	1.36508	1.36531	1.36565	1.36597
0.7992	1.36322	1.36320	1.35688	1.36545	1.36545	1.36289	1.36306	1.36332	1.36356
0.8977	1.36124	1.36114	1.35737	1.36248	1.36248	1.36095	1.36105	1.36120	1.36135
0.9583	1.35994	1.36005	1.35847	1.36062	1.36062	1.35997	1.36002	1.36008	1.36014
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index

Table 7. Refractive index of (Dimethyl Carbonate (1)+1-pentanol (2)) mixture at various temperatures by different mixing rules.

x_1	n_m*	n_mGD	n_mAB	n_mH	n_mW	n_mLL	n_mEyk	n_mOs	n_mNn
				T = 293.15 K					
0.0000	1.40986	1.40986	1.40986	1.40964	1.40986	1.40986	1.40986	1.40986	1.40986
0.0482	1.40807	1.40769	1.40624	1.40802	1.40822	1.40759	1.40765	1.40773	1.40780
0.0991	1.40609	1.40548	1.40276	1.40628	1.40647	1.40529	1.40540	1.40556	1.40568
0.1941	1.40226	1.40138	1.39661	1.40296	1.40311	1.40105	1.40124	1.40152	1.40174
0.2974	1.39815	1.39721	1.39131	1.39923	1.39935	1.39680	1.39704	1.39739	1.39766
0.3939	1.39407	1.39336	1.38689	1.39560	1.39569	1.39290	1.39316	1.39355	1.39386
0.4993	1.38981	1.38903	1.38214	1.39144	1.39151	1.38854	1.38882	1.38923	1.38956
0.6000	1.38560	1.38495	1.37836	1.38728	1.38732	1.38448	1.38475	1.38514	1.38546
0.7013	1.38143	1.38076	1.37481	1.38287	1.38289	1.38034	1.38058	1.38093	1.38121
0.8013	1.37736	1.37662	1.37197	1.37828	1.37829	1.37630	1.37648	1.37676	1.37698
0.8915	1.37337	1.47070	1.72936	1.37538	1.37538	1.48652	1.47731	1.46508	1.45522
0.9503	1.37071	1.37037	1.36876	1.37095	1.37095	1.37026	1.37032	1.37041	1.37049
1.0000	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835	1.36835
				T = 298.15 K					
0.0000	1.40789	1.40789	1.40789	1.40767	1.40789	1.40789	1.40789	1.40789	1.40789
0.0457	1.40599	1.40590	1.40469	1.40614	1.40634	1.40582	1.40587	1.40594	1.40600
0.1016	1.40370	1.40352	1.40103	1.40423	1.40442	1.40334	1.40345	1.40359	1.40371
0.1979	1.39972	1.39947	1.39518	1.40086	1.40101	1.39916	1.39934	1.39960	1.39980
0.3057	1.39526	1.39512	1.38968	1.39696	1.39707	1.39473	1.39496	1.39529	1.39555
0.4024	1.39125	1.39121	1.38511	1.39330	1.39339	1.39077	1.39102	1.39139	1.39168
0.5030	1.38709	1.38709	1.38067	1.38932	1.38938	1.38663	1.38689	1.38728	1.38759

0.5793	1.38395	1.38391	1.37743	1.38617	1.38622	1.38345	1.38371	1.38410	1.38441
0.7034	1.37879	1.37875	1.37296	1.38080	1.38083	1.37835	1.37858	1.37892	1.37920
0.8003	1.37480	1.37471	1.37005	1.37636	1.37637	1.37439	1.37457	1.37484	1.37506
0.9018	1.37052	1.37042	1.36757	1.37144	1.37145	1.37023	1.37034	1.37050	1.37063
0.9494	1.36854	1.36844	1.36678	1.36904	1.36904	1.36833	1.36839	1.36849	1.36856
1.0000	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640	1.36640
T = 303.15 K									
0.0000	1.40578	1.40578	1.40578	1.40556	1.40578	1.40578	1.40578	1.40578	1.40578
0.0539	1.40350	1.40350	1.40224	1.40374	1.40395	1.40340	1.40346	1.40353	1.40359
0.0906	1.40190	1.40194	1.39986	1.40249	1.40268	1.40178	1.40187	1.40200	1.40210
0.1979	1.39743	1.39749	1.39357	1.39873	1.39888	1.39720	1.39737	1.39761	1.39779
0.2613	1.39484	1.39491	1.39025	1.39644	1.39657	1.39457	1.39477	1.39506	1.39528
0.3902	1.38942	1.38959	1.38369	1.39159	1.39169	1.38916	1.38941	1.38977	1.39005
0.4928	1.38520	1.38537	1.37907	1.38754	1.38761	1.38492	1.38518	1.38556	1.38586
0.5918	1.38109	1.38130	1.37512	1.38344	1.38349	1.38086	1.38111	1.38148	1.38178
0.6923	1.37678	1.37711	1.37150	1.37908	1.37910	1.37672	1.37694	1.37728	1.37755
0.7920	1.37269	1.37295	1.36849	1.37451	1.37453	1.37264	1.37282	1.37308	1.37329
0.8943	1.36837	1.36863	1.36598	1.36957	1.36957	1.36845	1.36856	1.36871	1.36884
0.9808	1.36490	1.36498	1.36451	1.36515	1.36515	1.36495	1.36497	1.36500	1.36502
1.0000	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414	1.36414
T = 313.15 K									
0.0000	1.40160	1.40160	1.40160	1.40137	1.40160	1.40160	1.40160	1.40160	1.40160
0.0467	1.39970	1.39953	1.39828	1.39977	1.39998	1.39945	1.39950	1.39957	1.39963
0.1037	1.39728	1.39703	1.39437	1.39777	1.39796	1.39684	1.39695	1.39710	1.39723
0.2514	1.39094	1.39075	1.38556	1.39244	1.39258	1.39039	1.39060	1.39090	1.39114
0.3005	1.38881	1.38871	1.38299	1.39060	1.39073	1.38831	1.38854	1.38888	1.38915
0.3996	1.38454	1.38447	1.37767	1.38677	1.38686	1.38401	1.38428	1.38467	1.38498
0.5052	1.38005	1.38006	1.37289	1.38251	1.38258	1.37958	1.37985	1.38026	1.38060
0.6059	1.37572	1.37587	1.36892	1.37826	1.37831	1.37540	1.37567	1.37606	1.37639
0.7024	1.37152	1.37181	1.36554	1.37398	1.37401	1.37139	1.37163	1.37198	1.37228
0.8053	1.36727	1.36749	1.36263	1.36919	1.36920	1.36717	1.36736	1.36762	1.36785
0.9051	1.36317	1.36326	1.36039	1.36427	1.36427	1.36308	1.36318	1.36334	1.36347
0.9651	1.36079	1.36072	1.35942	1.36117	1.36117	1.36064	1.36068	1.36075	1.36081
1.0000	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932	1.35932

*Experimental value of refractive index

Table 8. Values of Average Percentage Deviation for various mixtures.

Mixture	T(K)	GD	AB	H	W	LL	Eyk	Os	Nn
DMC+ Methanol	293	0.0360	0.0234	0.0547	0.0509	0.0396	0.0371	0.0338	0.0321
	303	0.0189	0.0276	0.0413	0.0371	0.0221	0.0198	0.0169	0.0154
	308	0.0097	0.0180	0.0189	0.0169	0.0120	0.0104	0.0086	0.0083
DMC+ Eethanol	293	0.0415	0.1444	0.0093	0.0092	0.0460	0.0437	0.0400	0.0363
	298	0.0079	0.1021	0.0265	0.0266	0.0119	0.0098	0.0064	0.0031
	303	0.0985	0.2166	0.0571	0.0557	0.1054	0.1016	0.0958	0.0907
	308	0.0214	0.2024	0.0522	0.0522	0.0273	0.0243	0.0197	0.0158
DMC+ 1-propanol	293	0.0338	0.2018	0.0340	0.0344	0.0422	0.0376	0.0307	0.0242
	298	0.0073	0.1983	0.0618	0.0623	0.0167	3.3103	3.0560	0.0056
	303	0.0300	0.2830	0.0665	0.0670	0.0407	0.0348	0.0267	0.0208
	308	0.0039	0.2360	0.0798	0.0803	0.0140	0.0081	0.0033	0.0100
DMC+ 2-propanol	293	0.0258	0.2513	0.0571	0.0572	0.0359	0.0305	0.0222	0.0141
	298	0.3472	1.4263	0.0815	0.0816	0.3865	0.3669	0.3341	0.3002
	303	0.0087	0.2144	0.0863	0.0865	0.0110	0.0095	0.0098	0.0174
	308	0.0163	0.3279	0.1023	0.1025	0.0264	0.0206	0.0144	0.0128

DMC+ 1-butanol	293	0.0527	0.3305	0.0657	0.0677	0.0693	0.0600	0.0465	0.0388
	298	0.0240	0.2715	0.0636	0.0654	0.0388	0.0305	0.0182	0.0087
	303	0.0105	0.2130	0.0877	0.0897	0.0059	0.0070	0.0156	0.0249
	308	0.0225	0.3250	0.0847	0.0867	0.0382	0.0290	0.0173	0.0119
DMC+ 2-butanol	293	0.0340	0.3795	0.0905	0.0921	0.0531	0.0425	0.0267	0.0128
	298	0.0033	0.3449	0.1223	0.1240	0.0198	0.0094	0.0071	0.0199
	303	0.0794	0.6110	0.1210	0.1226	0.0999	0.0865	0.0816	0.0855
	308	0.0304	0.4134	0.1476	0.1492	0.0491	0.0389	0.0245	0.0262
DMC+ 1-pentanol	293	0.0400	0.3168	0.0566	0.0598	0.0594	0.0482	0.0320	0.0189
	298	0.0059	0.2688	0.0845	0.0883	0.0244	0.0137	0.0057	0.0143
	303	0.0092	0.2324	0.0911	0.0950	0.0096	0.0044	0.0164	0.0280
	308	0.0089	0.2850	0.0958	0.0996	0.0196	0.0109	0.0118	0.0222