

SUPPORTING INFORMATION

Hydrophobics of C_nTAB in aqueous DMSO-BSA nanoemulsion for flavonoids monodispersion

K. M. Sachin^a and Man Singh^{a*}

School of Chemical Sciences, Central University of Gujarat, Sector-30, Gandhinagar-
382030, India

Corresponding author *E-mail: *mansingh50@hotmail.com Phone: +91-079-23260210; Fax:
+91-079-23260076

Table S1 Density ($\rho/10^3\text{kg}\cdot\text{m}^{-3}$), surface tension ($\gamma/\text{mN}\cdot\text{m}^{-1}$), friccohesity (σ), dipole moment (u/D), conductivity ($\kappa/\text{mS}\cdot\text{cm}^{-1}$), Viscosity ($\eta/10^{-3}\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$) of different concentration of DMSO in aqueous system at $T = 298.15\text{ K}$ and $p = 0.1\text{MPa}$

DMSO %	$\rho/10^3\text{kg}\cdot\text{m}^{-3}$	$\gamma/\text{mN}\cdot\text{m}^{-1}$	$\eta/10^{-3}\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$	$\sigma/\text{s}\cdot\text{cm}^{-1}$ 1	u/D	$\kappa/\text{mS}\cdot\text{cm}^{-1}$
aq-DMSO						
1	0.99838	68.84	0.9077	0.013186	3.8044	1.592
2	0.999606	67.91	0.9159	0.013487	3.7938	1.632
3	1.000902	67.67	0.9238	0.013653	3.7879	1.660
4	1.002031	67.09	0.9638	0.014366	3.7623	1.705
5	1.003390	66.86	0.9852	0.014736	3.7489	1.716
6	1.005151	66.65	1.0094	0.015144	3.7340	1.735
7	1.006315	66.41	1.0799	0.016260	3.6926	2.429
8	1.007700	66.19	1.1010	0.016633	3.6785	2.498
9	1.009034	65.96	1.1185	0.016957	3.6662	1.859
10	1.010903	65.78	1.1395	0.017325	3.6522	1.519
15	1.019073	63.62	1.2783	0.020094	3.5429	2.633
20	1.026263	63.50	1.4622	0.023029	3.4207	1.629
25	1.034420	62.06	1.5649	0.025216	3.3253	1.952
30	1.042617	60.21	1.7873	0.029685	3.1189	1.975
aq-DMSO-Quercetin						
1	0.998275	72.44	0.9957	0.013745	3.7846	6.350
2	0.999769	71.06	1.3120	0.018464	3.6079	3.564
3	1.001262	73.42	1.3051	0.017776	3.6348	3.273
4	1.002529	70.53	1.2434	0.017630	3.6404	6.133
5	1.003825	70.98	1.1139	0.015693	3.7138	2.280
6	1.004956	70.70	1.4046	0.019867	3.5521	3.563
7	1.006347	71.52	1.4003	0.019578	3.5637	2.012
8	1.007863	70.55	1.4838	0.021034	3.5045	3.351
9	1.008808	69.91	1.5444	0.022092	3.4604	2.794
10	1.010154	70.71	1.3985	0.019780	3.5556	2.617
15	1.017642	67.81	1.7473	0.025769	3.3006	2.326
20	1.024877	66.37	1.8767	0.028275	3.1857	3.280
25	1.031913	65.60	1.8633	0.028403	3.1797	4.566

30 1.039376 63.74 1.7410 0.027315 3.2303 3.053

The standard uncertainties of variable concentration (%) of DMSO are corresponded to a 95% confidence interval are $u(\rho) = \pm 0.50 \times 10^{-2} \text{ kg}\cdot\text{m}^{-3}$; $u(\gamma) = \pm 0.98 \text{ mNm}^{-1}$; $u(\eta) = \pm 0.1018 \cdot 10^{-3} \text{ kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$; $u(\sigma) = \pm 0.001822 \text{ s}\cdot\text{cm}^{-1}$; $u(u) = \pm 0.0552$; and $u(\kappa) = \pm 0.3676 \text{ mS}\cdot\text{cm}^{-1}$ respectively.

Table S2 The $\sigma/\text{s}\cdot\text{cm}^{-1}$, u/D , $\eta / 10^{-3} \text{ kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$ and γ / mNm^{-1} value of WD, WDQ, WBD, WBDQ, WBDA, and WBDN system

	$\sigma/\text{s}\cdot\text{cm}^{-1}$	u/D	$\eta / 10^{-3} \text{ kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$	γ / mNm^{-1}
Systems				
WD	0.016948	3.8880	1.1196	66.07
WDQ	0.022696	3.8319	1.4882	66.12
WBD	0.023616	3.8253	1.5059	65.46
WBDQ	0.021401	3.8423	1.4951	65.45
WBDA	0.024117	3.8220	1.5202	69.89
WBDN	0.021961	3.8377	1.5004	62.89

The standard uncertainties corresponded to a 95% confidence interval are $u(\sigma) = \pm 0.001052 \text{ s}\cdot\text{cm}^{-1}$; $u(u) = \pm 0.0098$; $u(\eta) = \pm 0.0638 \cdot 10^{-3} \text{ kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$ and $u(\gamma) = \pm 0.92 \text{ mNm}^{-1}$ respectively.

Table S3 Comparison of measured ρ values of sodium chloride ($1.0 \text{ mol}\cdot\text{kg}^{-1}$) in aqueous medium and 10% (w/w) aq-DMSO at $T = 298.15 \text{ K}$ with literature value and uncertainty (u)

T/K	Lit. ^[32, 33] ($\rho/10^3 \text{ kg}\cdot\text{m}^{-3}$)	Exp. ($\rho/10^3 \text{ kg}\cdot\text{m}^{-3}$)	$\rho(u)$	% deviation in ρ
298.15	1.03605	aq-NaCl		
		1.036015	$\pm 4.21 \cdot 10^{-06}$	-0.002
		1.036024		
		1.036029		
		1.036035		
		1.036039		
298.15	1.0105	1.036043		
		10% aq- DMSO		
		1.009080	$\pm 4.01 \cdot 10^{-07}$	-0.14
		1.009078		
		1.009078		
		1.009077		
		1.009078		
		1.009078		

Estimated uncertainty in density measurement was $< \pm 1 \cdot 10^{-6} \text{ g}\cdot\text{cm}^{-3}$.

Table S4 The ρ , η and n_D value of 5, 10, 15 and 20% (w/w) aq-DMSO at $T = 298.15$ K

Systems	$\rho / 10^3 \text{ kg} \cdot \text{m}^{-3}$		$\eta / 10^{-3} \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1}$		n_D		$\Delta\rho$	$\Delta\eta$	Δn_D
	Exp.	Lit. ^[33] , [36]	Exp.	Lit. ^[33]	Exp.	Lit. ^[33]			
5% (w/w) aq-DMSO	1.003071	1.0038	0.9321	0.96	1.3391	1.3390	- 0.00073	-0.0279	0.0001
10% (w/w) aq-DMSO	1.009813	1.009900	1.0127	1.06	1.3460	1.3458	-0.0001	-0.0473	0.0002
15% (w/w) aq-DMSO	1.016165	1.0174	1.1647	1.18	1.3529	1.3527	- 0.00124	-0.0153	0.0002
20% (w/w) aq-DMSO	1.023219	1.023623	1.3397	1.34	1.3606	1.3600	-0.0004	0.0997	0.0005

Unit: $\Delta\rho = 10^3 \text{ kg} \cdot \text{m}^{-3}$, $\Delta\eta = 10^{-3} \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1}$

$\Delta\rho = \text{Exp.} - \text{Lit.}$, $\Delta\eta = \text{Exp.} - \text{Lit.}$, $\Delta n_D = \text{Exp.} - \text{Lit.}$ value % in weight/weight.

Table S5 Increased percentage dispersibility of quercetin with BSA and without BSA in presence of DTAB, TDTAB and HDTAB at $\lambda = 385 \text{ nm}$

Water	With BSA	Without BSA	Times increased dispersibility	
			With BSA	Without BSA
DTAB (385 nm)				
0.086	0.97	0.693	11.27	8.05
TDTAB (385nm)				
0.086	0.959	0.883	11.15	10.27
HDTAB (385nm)				
0.086	1.072	1.284	12.47	14.93

Table S6 Viscosity ($\eta/10^{-3} \text{ kg}\cdot\text{m}^{-1}\cdot\text{s}^{-1}$) of C_nTAB with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

$m/\text{mol}\cdot\text{kg}^{-1}$	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K
	WBD-DTAB			WBD-TDTAB			WBD-HDTAB		
0.00	1.0299	0.8651	0.8441	1.0299	0.8651	0.8441	1.0299	0.8651	0.8441
0.01	1.0325	0.8570	0.8644	1.1117	0.8916	0.9799	1.1260	0.9905	0.9801
0.02	1.0410	0.9023	0.8811	1.1367	0.9415	0.9855	1.2624	1.0860	1.0617
0.04	1.0340	0.9719	0.9303	1.1637	1.0086	1.0052	1.4437	1.1387	1.0941
0.06	1.1168	1.0144	0.9631	1.3425	1.0676	1.0323	1.7583	1.1851	1.1448
0.08	1.2108	1.0532	1.0255	1.5539	1.1215	1.0648	2.0194	1.2318	1.1678
0.10	1.3914	1.0817	1.0623	1.9471	1.1589	1.0936	2.4581	1.3074	1.2045
	WBDQ-DTAB			WBDQ-TDTAB			WBDQ-HDTAB		
0.00	1.0225	0.8667	0.8733	1.0225	0.8667	0.8733	1.0225	0.8667	0.9649
0.01	1.0289	0.8508	0.8374	1.0539	0.9073	0.8658	1.3024	0.9128	0.9030
0.02	1.1077	0.9403	0.9832	1.1053	0.9589	0.8904	1.3972	0.9750	0.9903
0.04	1.1056	1.0974	1.0393	1.1510	0.9326	0.9869	1.2214	1.0914	1.0161
0.06	1.1607	0.9169	0.9288	1.2050	1.0041	1.0473	1.2992	1.1023	1.1009
0.08	1.2071	1.0541	0.9896	1.2704	1.1534	1.0584	1.3775	1.1459	1.1634
0.10	1.2233	1.0950	1.0233	1.3134	1.0760	1.1220	1.4506	1.2956	0.9649
	WBDA-DTAB			WBDA-TDTAB			WBDA-HDTAB		
0.00	1.0397	0.8318	0.8844	1.0397	0.8318	0.8844	1.0397	0.8318	0.8844
0.01	1.0329	0.9607	0.8341	1.0678	0.9080	0.8610	1.0928	0.9072	0.9584
0.02	1.0593	0.9925	0.9805	1.0855	0.9474	0.8869	1.2364	0.9815	0.8982
0.04	1.1158	0.9154	1.0379	1.1979	0.9928	0.9852	1.3388	1.2711	0.9869
0.06	1.1306	0.9984	0.9284	1.2169	1.0787	1.0465	1.3764	1.3071	1.0141
0.08	1.1758	1.0211	0.9894	1.2552	1.0932	1.0579	1.4295	1.3862	1.0993
0.10	1.1954	1.0471	1.0234	1.3465	1.1152	1.1216	1.5244	1.4522	1.1624
	WBDN-DTAB			WBDN-TDTAB			WBDN-HDTAB		
0.00	1.0261	0.9571	0.9223	1.0261	0.9571	0.9223	1.0261	0.9571	0.9223
0.01	1.0278	0.9531	1.0160	1.0590	0.9015	0.9130	1.2943	0.9920	1.0621
0.02	1.0573	0.8951	1.0671	1.0983	0.8841	0.8999	1.3181	0.9650	1.0258
0.04	1.0774	0.9322	0.9721	1.1556	1.0445	0.9117	1.3514	1.2557	0.9742
0.06	1.1118	0.9226	1.0349	1.2208	1.0334	1.0084	1.2885	1.0757	1.0763
0.08	1.1723	0.9525	1.0166	1.2438	1.0950	1.0509	1.3504	1.1646	1.1889
0.10	1.2635	1.0953	0.9679	1.3256	1.3147	1.1175	1.4943	1.1593	1.1769

The m ($\text{mol}\cdot\text{kg}^{-1}$) is C_nTAB molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $\text{C}_n\text{TAB} = \pm 3 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ M}\cdot\text{mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01$

MPa, and combined expanded uncertainties U_c (95% confidence interval) is $U_c(\eta) = \pm 0.56 \times 10^{-4} \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1}$.

Table S7 Density ($\rho/10^3 \text{ kg} \cdot \text{m}^{-3}$) of C_nTAB with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

$m/\text{mol} \cdot \text{kg}^{-1}$	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K
	WBD-DTAB			WBD-TDTAB			WBD-HDTAB		
0.00	1.009125	1.007193	1.005488	1.009125	1.007193	1.005488	1.009125	1.007193	1.005488
0.01	1.009402	1.008625	1.005881	1.008408	1.007645	1.005477	1.008035	1.007083	1.005019
0.02	1.010488	1.008712	1.006218	1.009971	1.008533	1.005623	1.009461	1.008022	1.005345
0.04	1.010599	1.008872	1.006668	1.010281	1.008712	1.006349	1.010049	1.008236	1.006000
0.06	1.010794	1.008924	1.006743	1.010599	1.008777	1.006422	1.010299	1.008304	1.006206
0.08	1.010903	1.009158	1.007044	1.010781	1.008947	1.006559	1.010398	1.008312	1.006322
0.10	1.010999	1.009265	1.007122	1.010811	1.009069	1.006699	1.010484	1.008354	1.006547
	WBDQ-DTAB			WBDQ-TDTAB			WBDQ-HDTAB		
0.00	1.008997	1.007087	1.005077	1.008997	1.007087	1.005077	1.008997	1.007087	1.005077
0.01	1.009516	1.007769	1.005646	1.008968	1.007329	1.005454	1.008901	1.007056	1.005345
0.02	1.009810	1.008045	1.005753	1.009588	1.007801	1.005543	1.009515	1.007588	1.005454
0.04	1.010333	1.008605	1.005975	1.010133	1.008345	1.005765	1.010072	1.008243	1.005599
0.06	1.010656	1.008851	1.006383	1.010363	1.008720	1.006220	1.010274	1.008618	1.006122
0.08	1.010814	1.009062	1.006879	1.010540	1.008878	1.006698	1.010382	1.008748	1.006614
0.10	1.010864	1.009099	1.007010	1.010569	1.008967	1.006780	1.010475	1.008829	1.006714
	WBDA-DTAB			WBDA-TDTAB			WBDA-HDTAB		
0.00	1.009471	1.007669	1.005878	1.009471	1.007669	1.005878	1.009471	1.007669	1.005878
0.01	1.009026	1.008458	1.001607	1.008451	1.007652	0.999867	1.007870	1.007367	0.998577
0.02	1.009208	1.008457	1.002947	1.008563	1.007770	1.001560	1.008180	1.007428	1.000156
0.04	1.009635	1.008561	1.004625	1.009010	1.008057	1.004013	1.008680	1.007648	1.002150
0.06	1.009990	1.008676	1.005967	1.009302	1.008334	1.005475	1.009103	1.007850	1.004128
0.08	1.010438	1.008875	1.006730	1.009738	1.008562	1.006310	1.009568	1.008176	1.005127
0.10	1.010777	1.009079	1.007094	1.010171	1.008756	1.006402	1.009899	1.008495	1.005866
	WBDN-DTAB			WBDN-TDTAB			WBDN-HDTAB		
0.00	1.007195	1.005388	1.003135	1.007195	1.005388	1.003135	1.007195	1.005388	1.003135
0.01	1.009713	1.007704	1.003171	1.008413	1.006600	1.002754	1.007892	1.001351	1.001351
0.02	1.010101	1.008162	1.004514	1.008955	1.007181	1.004155	1.008422	1.005672	1.003201
0.04	1.010570	1.008798	1.006188	1.009881	1.008013	1.005622	1.009352	1.006568	1.005101
0.06	1.010852	1.009143	1.007246	1.010332	1.008452	1.006428	1.009920	1.007568	1.005990
0.08	1.011076	1.009430	1.007833	1.010433	1.008588	1.006947	1.010141	1.008104	1.006510
0.10	1.011212	1.009440	1.007953	1.010405	1.008571	1.006999	1.010182	1.008432	1.006785

The m ($\text{mol} \cdot \text{kg}^{-1}$) is C_nTAB molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $\text{C}_n\text{TAB} = \pm 3 \times 10^{-4} \text{ mol} \cdot \text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to

a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ M/mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ m/mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$, and expanded uncertainties $U_c(95\% \text{ confidence interval})$ is $U_c(\rho) = \pm 1.6 \times 10^{-2} \text{ kg}\cdot\text{m}^{-3}$.

3.

Table S8 The $u/\text{m}\cdot\text{s}^{-1}$ of C_nTAB with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

$m/\text{mol}\cdot\text{kg}^{-1}$	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K
	WBD-DTAB			WBD-TDTAB			WBD-HDTAB		
0	1543.02	1549.54	1555.87	1543.02	1549.54	1555.87	1543.02	1549.54	1555.87
0.01	1547.22	1554.53	1560.64	1546.93	1553.87	1559.87	1546.36	1553.21	1559.20
0.02	1549.19	1555.92	1561.55	1547.13	1553.99	1559.77	1545.84	1552.72	1558.51
0.04	1549.49	1556.26	1562.04	1546.74	1553.49	1559.32	1546.15	1552.62	1558.08
0.06	1549.42	1555.97	1561.40	1546.55	1553.05	1558.50	1545.89	1552.27	1557.61
0.08	1549.39	1555.79	1561.16	1546.43	1552.84	1558.10	1545.71	1551.93	1557.10
0.1	1549.37	1555.69	1560.85	1546.33	1552.56	1557.82	1545.69	1551.69	1556.61
	WBDQ-DTAB			WBDQ-TDTAB			WBDQ-HDTAB		
0	1542.96	1549.87	1555.85	1542.96	1549.87	1555.85	1542.96	1549.87	1555.85
0.01	1545.39	1552.63	1558.58	1543.76	1550.29	1557.67	1544.14	1549.23	1555.99
0.02	1546.96	1554.72	1560.75	1547.13	1554.16	1560.06	1548.45	1554.88	1560.58
0.04	1548.65	1555.57	1561.47	1546.83	1553.77	1559.24	1546.32	1553.38	1559.59
0.06	1548.53	1555.42	1560.98	1547.01	1553.65	1559.12	1548.04	1554.59	1560.35
0.08	1548.72	1555.33	1560.80	1546.91	1553.37	1558.49	1547.96	1554.20	1558.90
0.10	1548.13	1554.67	1560.10	1546.15	1552.51	1557.81	1547.66	1554.03	1558.75
	WBDA-DTAB			WBDA-TDTAB			WBDA-HDTAB		
0.00	1544.64	1552.35	1558.16	1544.64	1552.35	1558.16	1544.64	1552.35	1558.16
0.01	1544.35	1551.80	1560.03	1542.66	1548.35	1553.57	1541.45	1548.01	1553.32
0.02	1544.65	1552.87	1558.93	1545.49	1552.09	1557.38	1544.94	1552.03	1557.79
0.04	1549.80	1556.21	1561.69	1545.29	1552.36	1558.07	1546.03	1552.68	1558.28
0.06	1548.27	1555.35	1560.93	1545.56	1552.41	1557.90	1546.82	1552.44	1557.67
0.08	1547.00	1555.45	1561.07	1546.05	1552.71	1558.42	1547.63	1552.01	1557.09
0.10	1548.29	1554.98	1560.41	1545.61	1552.88	1558.35	1550.22	1551.52	1556.21
	WBDN-DTAB			WBDN-TDTAB			WBDN-HDTAB		
0.00	1536.14	1543.92	1550.51	1536.14	1543.92	1550.51	1536.14	1543.92	1550.51
0.01	1545.56	1552.26	1558.12	1540.69	1545.75	1552.81	1543.09	1551.12	1555.53
0.02	1549.93	1556.64	1562.28	1544.79	1551.73	1557.17	1545.16	1552.97	1557.92
0.04	1550.04	1556.81	1562.48	1545.39	1552.42	1558.38	1544.13	1552.39	1555.58
0.06	1549.80	1556.48	1561.95	1547.36	1551.93	1559.46	1545.27	1552.38	1557.02
0.08	1550.08	1556.39	1561.67	1546.13	1552.44	1557.39	1545.56	1551.66	1557.01
0.10	1550.11	1556.30	1561.47	1546.54	1552.41	1557.83	1546.07	1551.30	1556.35

The m ($\text{mol}\cdot\text{kg}^{-1}$) is C_nTAB molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of

$C_n\text{TAB} = \pm 3 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$, and expanded uncertainties U_c (95% confidence interval) is $U_c(u) = \pm 1.2 \times 10^{-1} \text{ mol}\cdot\text{kg}^{-1}$.

Table S9 The $\Delta H / \text{kJ}\cdot\text{mol}^{-1}$ of $C_n\text{TAB}$ with WBD, WBDQ, WBDA and WBDN

Systems	$\Delta H / \text{kJ}\cdot\text{mol}^{-1}$
WBD-DTAB	-18.07
WBD-TDTAB	469.50
WBD-HDTAB	22.82
WBDQ-DTAB	-19.27
WBDQ-TDTAB	330.23
WBDQ-HDTAB	783.02
WBDA-DTAB	8.80
WBDA-TDTAB	-680.74
WBDA-HDTAB	-213.23
WBDN-DTAB	342.73
WBDN-TDTAB	228.46
WBDN-HDTAB	1167.90

The m ($\text{mol}\cdot\text{kg}^{-1}$) is $C_n\text{TAB}$ molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $C_n\text{TAB} = \pm 3 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$.

Table S10 The $\Delta S / \text{kJ}\cdot\text{mol}^{-1}$ of $C_n\text{TAB}$ with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

T/K	$\Delta S / \text{kJ}\cdot\text{mol}^{-1}$		
	WBD-DTAB	WBD-TDTAB	WBD-HDTAB
298.15	-36.34	-5.45	0.56
303.15	-18.08	-7.72	0.01
308.15	-13.56	5.36	0.44
	WBDQ-DTAB	WBDQ-TDTAB	WBDQ-HDTAB

298.15	-13.41	-13.36	11.51
303.15	-13.58	-16.27	-0.61
308.15	-14.63	7.71	0.86
	WBDA-DTAB	WBDA-TDTAB	WBDA-HDTAB
298.15	-24.58	-13.01	-2.52
303.15	-28.11	-2.68	-0.86
308.15	-19.59	-13.64	-4.83
	WBDN-DTAB	WBDN-TDTAB	WBDN-HDTAB
298.15	-21.29	-7.47	12.13
303.15	-13.51	-9.77	-6.52
308.15	-3.04	-12.33	6.17

The m ($\text{mol}\cdot\text{kg}^{-1}$) is $C_n\text{TAB}$ molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $C_n\text{TAB} = \pm 3 \times 10^{-4} m/\text{mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} M/\text{mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} m/\text{mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01$ K, $u(p) = \pm 0.01$ MPa.

Table S11 The $\Delta G/\text{kJ}\cdot\text{mol}^{-1}$ of $C_n\text{TAB}$ with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15)$ K and $p = 0.1$ MPa

T/K	$\Delta G/\text{kJ}\cdot\text{mol}^{-1}$		
	WBD-DTAB	WBD-TDTAB	WBD-HDTAB
298.15	5127.87	-3594.23	-5832.52
303.15	-321.00	-2975.16	-5766.05
308.15	-1719.79	-7064.02	-5995.02
	WBDQ-DTAB	WBDQ-TDTAB	WBDQ-HDTAB
298.15	-1711.42	-1376.08	-8338.141
303.15	-1687.76	-521.64	-4817.02
308.15	-1390.56	-7925.79	-5362.513
	WBDA-DTAB	WBDA-TDTAB	WBDA-HDTAB
298.15	1648.58	-2489.75	-5150.56
303.15	2746.34	-5654.69	-5736.70
308.15	163.19	-2358.15	-4604.66
	WBDN-DTAB	WBDN-TDTAB	WBDN-HDTAB
298.15	1000.30	-3233.50	-8138.91
303.15	-1345.62	-2595.96	-2642.07
308.15	-4602.19	-1852.87	-6614.90

The m ($\text{mol}\cdot\text{kg}^{-1}$) is $C_n\text{TAB}$ molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $C_n\text{TAB} = \pm 3 \times 10^{-4} m/\text{mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} M/\text{mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m)$

$= \pm 1.0 \times 10^{-4} \text{ m/mol} \cdot \text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$.

Table S12 The ε_{∞} of C_nTAB with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

$m/\text{mol} \cdot \text{kg}^{-1}$	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K
	WBD-DTAB			WBD-TDTAB			WBD-HDTAB		
0.00	1.8131	1.8117	1.8101	1.8131	1.8117	1.8101	1.8131	1.8117	1.8101
0.01	1.8139	1.8133	1.8109	1.8128	1.8114	1.8093	1.8133	1.8123	1.8101
0.02	1.8152	1.8149	1.8128	1.8158	1.8160	1.8128	1.8166	1.8149	1.8125
0.04	1.8174	1.8168	1.8141	1.8179	1.8174	1.8149	1.8187	1.8187	1.8158
0.06	1.8195	1.8193	1.8163	1.8206	1.8190	1.8176	1.8203	1.8214	1.8179
0.08	1.8217	1.8212	1.8187	1.8257	1.8222	1.8220	1.8236	1.8260	1.8203
0.10	1.8241	1.8228	1.8206	1.8266	1.8252	1.8228	1.8263	1.8249	1.8236
	WBDQ-DTAB			WBDQ-TDTAB			WBDQ-HDTAB		
0.00	1.8131	1.8109	1.8093	1.8131	1.8109	1.8093	1.8131	1.8109	1.8093
0.01	1.8139	1.8123	1.8096	1.8149	1.8131	1.8114	1.8133	1.8120	1.8104
0.02	1.8155	1.8144	1.8128	1.8163	1.8147	1.8131	1.8155	1.8147	1.8117
0.04	1.8179	1.8174	1.8149	1.8190	1.8187	1.8155	1.8182	1.8174	1.8147
0.06	1.8201	1.8182	1.8163	1.8228	1.8206	1.8176	1.8209	1.8217	1.8176
0.08	1.8222	1.8214	1.8193	1.8239	1.8236	1.8209	1.8236	1.8225	1.8203
0.10	1.8247	1.8236	1.8222	1.8274	1.8249	1.8225	1.8266	1.8257	1.8201
	WBDA-DTAB			WBDA-TDTAB			WBDA-HDTAB		
0.00	1.8141	1.8109	1.8090	1.8141	1.8109	1.8090	1.8141	1.8109	1.8090
0.01	1.8139	1.8120	1.8104	1.8131	1.8117	1.8096	1.8139	1.8120	1.8112
0.02	1.8155	1.8144	1.8128	1.8147	1.8131	1.8117	1.8155	1.8144	1.8125
0.04	1.8179	1.8160	1.8136	1.8179	1.8163	1.8147	1.8185	1.8163	1.8152
0.06	1.8201	1.8190	1.8174	1.8206	1.8187	1.8182	1.8212	1.8190	1.8182
0.08	1.8222	1.8222	1.8198	1.8225	1.8220	1.8182	1.8236	1.8220	1.8209
0.10	1.8239	1.8222	1.8201	1.8266	1.8249	1.8220	1.8260	1.8249	1.8230
	WBDN-DTAB			WBDN-TDTAB			WBDN-HDTAB		
0.00	1.8128	1.8104	1.8093	1.8128	1.8104	1.8093	1.8128	1.8104	1.8093
0.01	1.8141	1.8114	1.8104	1.8141	1.8120	1.8098	1.8147	1.8117	1.8106
0.02	1.8155	1.8147	1.8123	1.8163	1.8144	1.8120	1.8174	1.8144	1.8131
0.04	1.8179	1.8163	1.8149	1.8182	1.8166	1.8144	1.8198	1.8195	1.8168
0.06	1.8203	1.8190	1.8168	1.8203	1.8198	1.8166	1.8212	1.8195	1.8179
0.08	1.8220	1.8209	1.8195	1.8230	1.8225	1.8195	1.8239	1.8225	1.8217
0.10	1.8239	1.8222	1.8209	1.8257	1.8247	1.8225	1.8271	1.8247	1.8236

The m ($\text{mol} \cdot \text{kg}^{-1}$) is C_nTAB molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $\text{C}_n\text{TAB} = \pm 3 \times 10^{-4} \text{ m/mol} \cdot \text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to

a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ M/mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ m/mol}\cdot\text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$, and expanded uncertainties $Uc(95\% \text{ confidence interval})$ is $Uc(\varepsilon_{\infty}) = \pm 1 \times 10^{-4}$.

Table S13 The Λ_m of $C_n\text{TAB}$ with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

$m/\text{mol}\cdot\text{g}^{-1}$	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K	298.15K	303.15K	308.15K
	WBD-DTAB			WBD-TDTAB			WBD-HDTAB		
0.01	68.47	72.84	76.56	52.78	54.68	55.69	27.98	28.11	29.92
0.02	62.76	68.40	70.82	34.49	36.17	36.67	24.51	25.03	25.66
0.04	46.66	48.83	50.45	29.61	31.32	31.74	25.70	26.02	26.33
0.06	39.26	41.93	43.57	24.42	25.73	26.23	20.54	21.23	22.50
0.08	36.20	38.78	41.00	25.18	25.80	26.38	20.59	21.91	23.19
0.10	33.98	36.63	38.78	22.87	23.69	24.11	22.32	23.39	24.25
	WBDQ-DTAB			WBDQ-TDTAB			WBDQ-HDTAB		
0.01	59.96	67.40	76.92	46.89	50.90	66.56	31.05	31.12	32.65
0.02	46.88	51.61	57.32	36.76	39.18	41.96	25.06	26.42	28.10
0.04	37.11	40.57	43.36	27.99	30.59	32.91	22.87	24.13	24.77
0.06	31.20	33.70	36.26	20.47	22.82	23.88	18.95	19.66	20.35
0.08	29.72	31.73	33.03	24.01	25.25	26.22	17.03	17.59	17.97
0.10	27.94	29.59	30.96	21.30	22.19	22.99	19.74	20.50	20.94
	WBDA-DTAB			WBDA-TDTAB			WBDA-HDTAB		
0.01	80.05	84.18	84.82	51.85	52.37	54.31	31.26	32.60	33.12
0.02	68.40	71.33	76.23	36.71	38.69	40.54	25.59	26.90	27.24
0.04	49.48	51.35	52.72	28.82	29.14	30.15	22.76	23.86	25.15
0.06	39.46	40.86	42.29	24.67	25.70	26.38	19.16	19.93	21.18
0.08	35.22	36.43	37.41	24.24	25.09	26.06	20.18	21.16	22.43
0.10	33.27	34.28	35.63	25.72	26.96	27.69	20.05	20.73	21.35
	WBDN-DTAB			WBDN-TDTAB			WBDN-HDTAB		
0.01	80.36	82.17	83.29	53.30	56.51	57.16	30.67	31.04	31.08
0.02	62.28	62.76	66.06	37.60	39.46	39.94	25.68	26.50	28.56
0.04	50.10	51.40	54.45	30.17	32.31	33.61	23.84	24.79	25.49
0.06	41.58	41.88	42.93	25.09	26.25	27.00	20.32	21.32	22.47
0.08	36.48	38.29	39.12	25.38	26.39	26.89	20.81	21.70	22.49
0.10	32.09	32.52	34.03	24.71	25.47	26.15	20.62	21.50	22.30

The m ($\text{mol}\cdot\text{kg}^{-1}$) is $C_n\text{TAB}$ molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to a 95% confidence interval $U_c(m)$ of $C_n\text{TAB} = \pm 3 \times 10^{-4} \text{ m/mol}\cdot\text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ M/mol}\cdot\text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m)$

$= \pm 1.0 \times 10^{-4} \text{ m/mol} \cdot \text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$, and combined expanded uncertainties U_c (95% confidence interval) is $U_c(\Lambda_m) = \pm 0.60 \text{ mS} \cdot \text{cm}^{-1}$.

Table S14 The Λ_m^0 of $C_n\text{TAB}$ with WBD, WBDQ, WBDA and WBDN at $T = (298.15, 303.15 \text{ and } 308.15) \text{ K}$ and $p = 0.1 \text{ MPa}$

T/K	$\Lambda_m^0 / \text{mS} \cdot \text{cm}^{-1}$		
	WBD-DTAB	WBD-TDTAB	WBD-HDTAB
298.15	78.20	56.15	29.68
303.15	84.15	58.20	29.74
308.15	88.25	59.17	31.23
	WBDQ-DTAB	WBDQ-TDTAB	WBDQ-HDTAB
298.15	66.13	53.12	34.16
303.15	74.38	57.00	34.54
308.15	85.34	73.07	36.58
	WBDA-DTAB	WBDA-TDTAB	WBDA-HDTAB
298.15	92.06	57.46	33.87
303.15	96.80	58.68	35.18
308.15	99.31	61.10	35.35
	WBDN-DTAB	WBDN-TDTAB	WBDN-HDTAB
298.15	87.64	58.39	32.73
303.15	89.04	61.71	33.01
308.15	91.21	62.19	33.58

The m ($\text{mol} \cdot \text{kg}^{-1}$) is $C_n\text{TAB}$ molality with WBD, WBDQ, WBDA and WBDN solvents separately. The combined uncertainties in molality to 95% confidence interval $U_c(m)$ of $C_n\text{TAB} = \pm 3 \times 10^{-4} \text{ m/mol} \cdot \text{kg}^{-1}$. Standard uncertainties (u) in solvent compositions (WBD) to a 95% confidence interval $u(M) = \pm 0.9 \times 10^{-4} \text{ M/mol} \cdot \text{L}^{-1}$; WBDQ, WBDA and WBDN $u(m) = \pm 1.0 \times 10^{-4} \text{ m/mol} \cdot \text{kg}^{-1}$ respectively. Standard uncertainties are $u(T) = \pm 0.01 \text{ K}$, $u(p) = \pm 0.01 \text{ MPa}$.

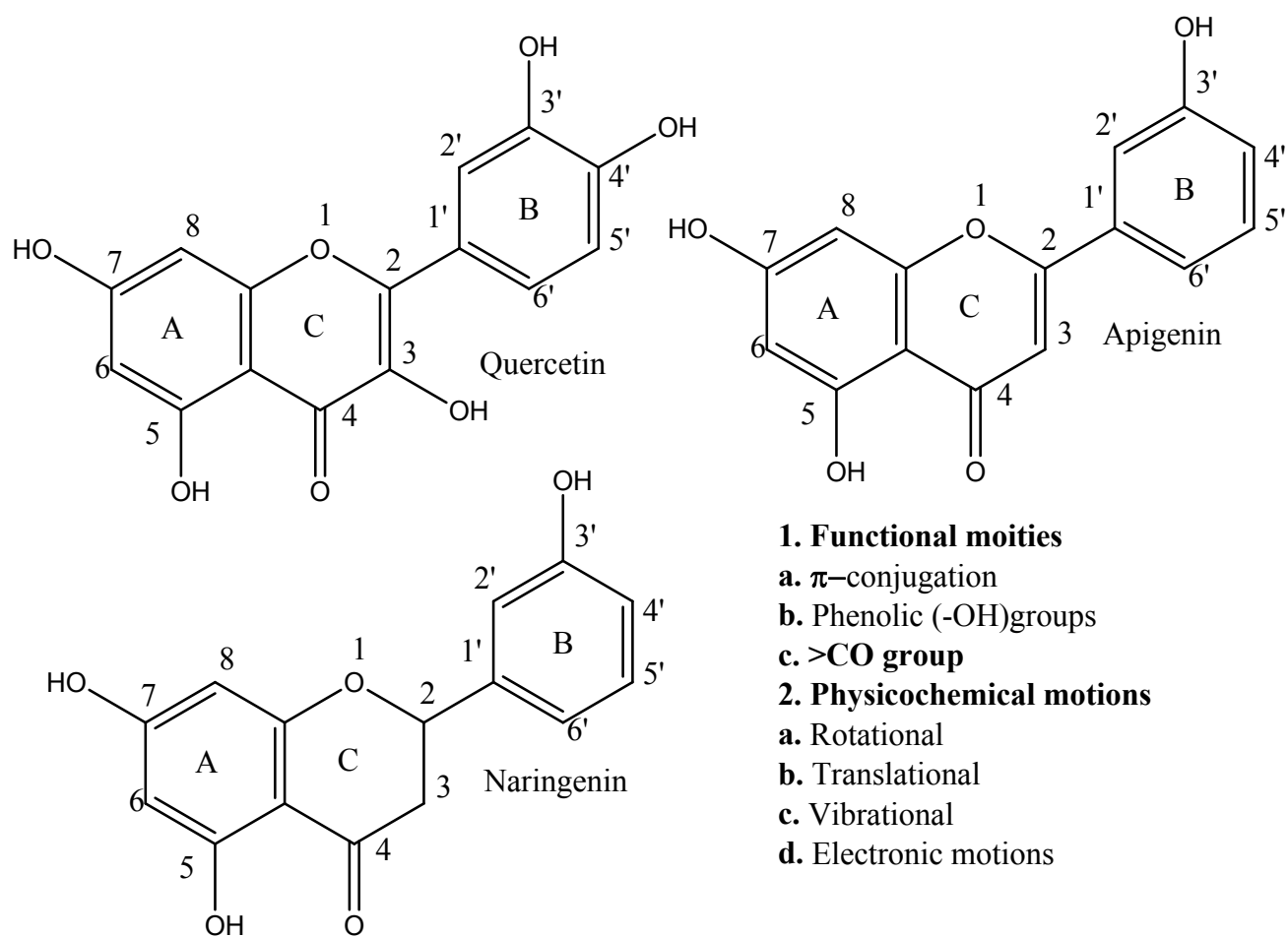


Fig. S1 Functional structures of Quercetin (Q), Apigenin (A) and Naringenin (N).

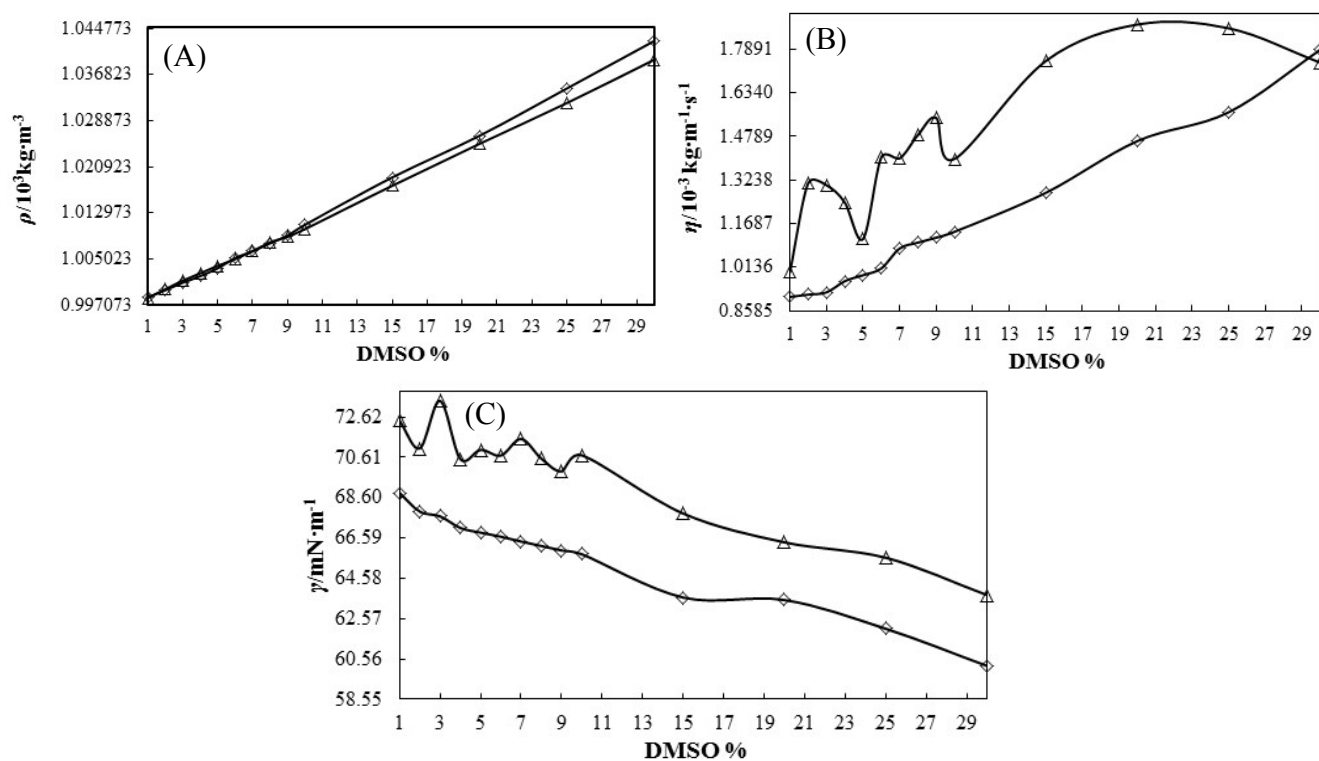


Fig. S2 The ρ (A), η (B) and γ (C) value of aq-DMSO ($\diamond$) and quercetin with aq-DMSO (Δ) system.

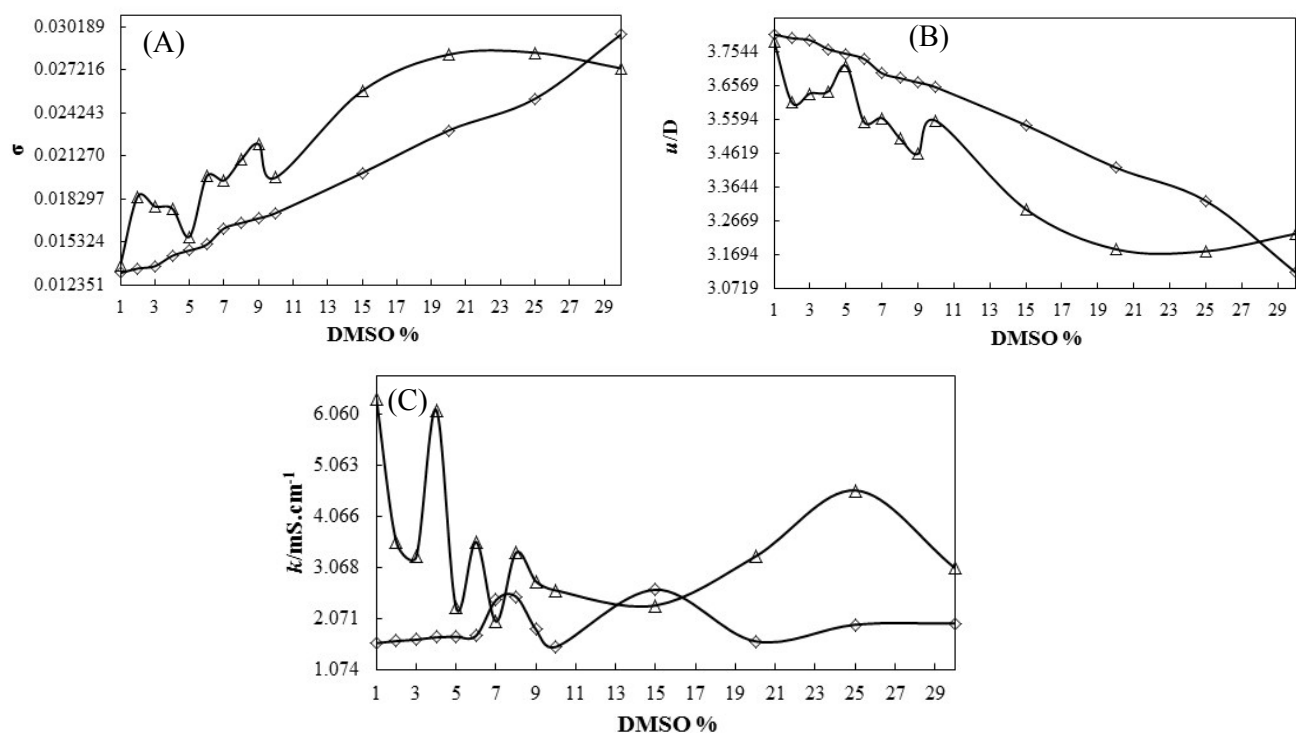


Fig. S3 The σ (A), u (B) and κ (C) value of aq-DMSO ($\diamond$) and quercetin with aq-DMSO (Δ) system.

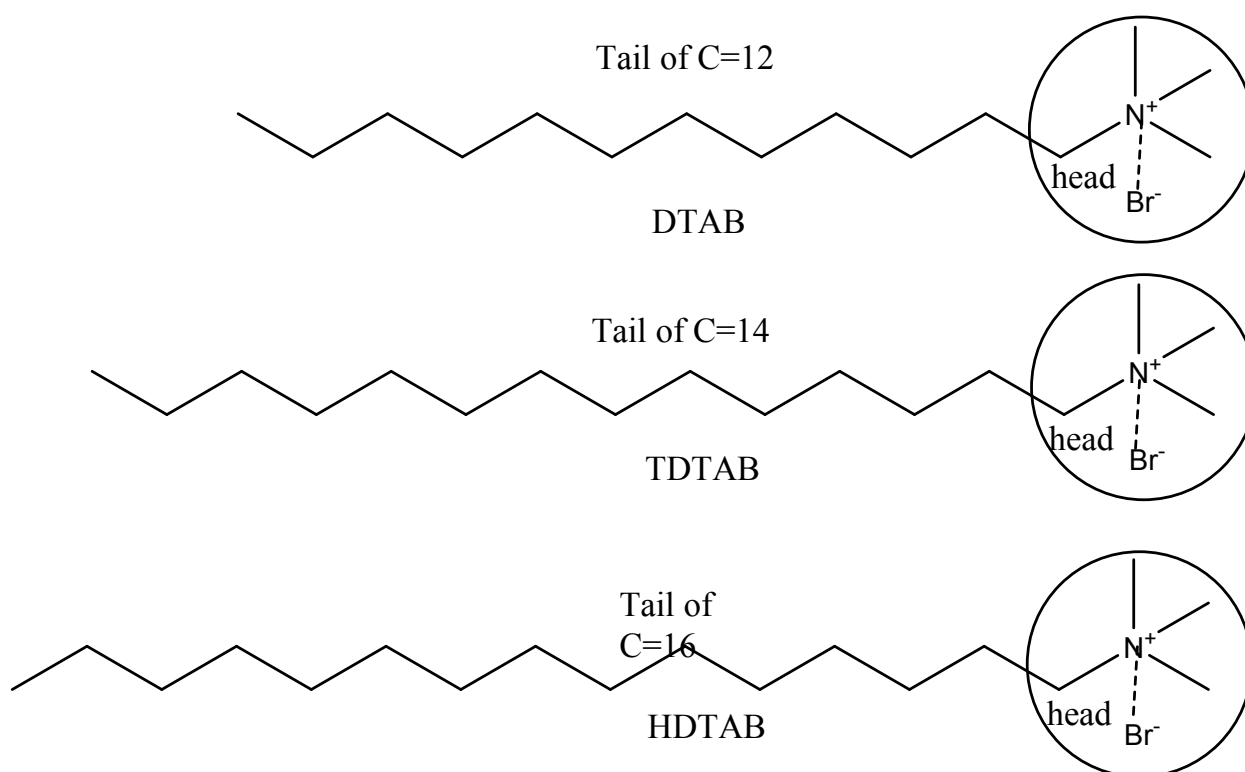


Fig. S4 Structures of dodecyltrimethyl ammonium bromide (DTAB), tetradecyltrimethyl ammonium bromide (TDTAB) and hexadecyltrimethyl ammonium bromide (HDTAB).

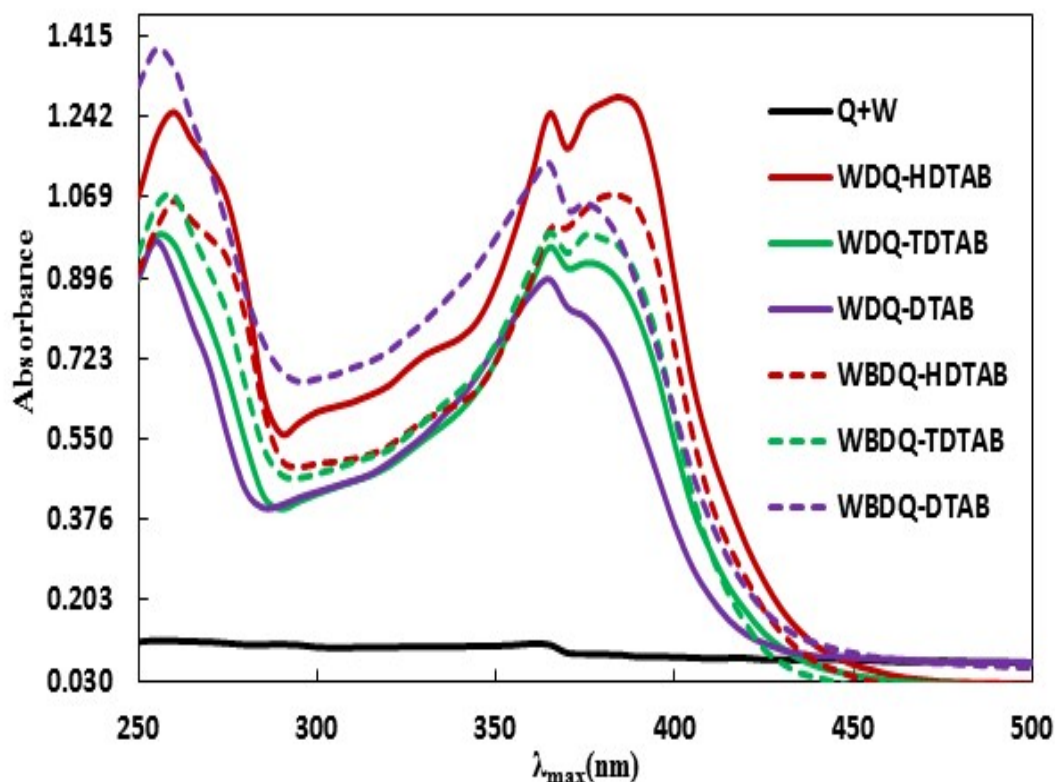


Fig. S5 Influence of DTAB, TDTAB, HDTAB and BSA on dispersion of aq- quercetin. Increased percentage dispersibility of quercetin with BSA and without BSA in presence of DTAB, TDTAB and HDTAB at $\lambda=385\text{nm}$.

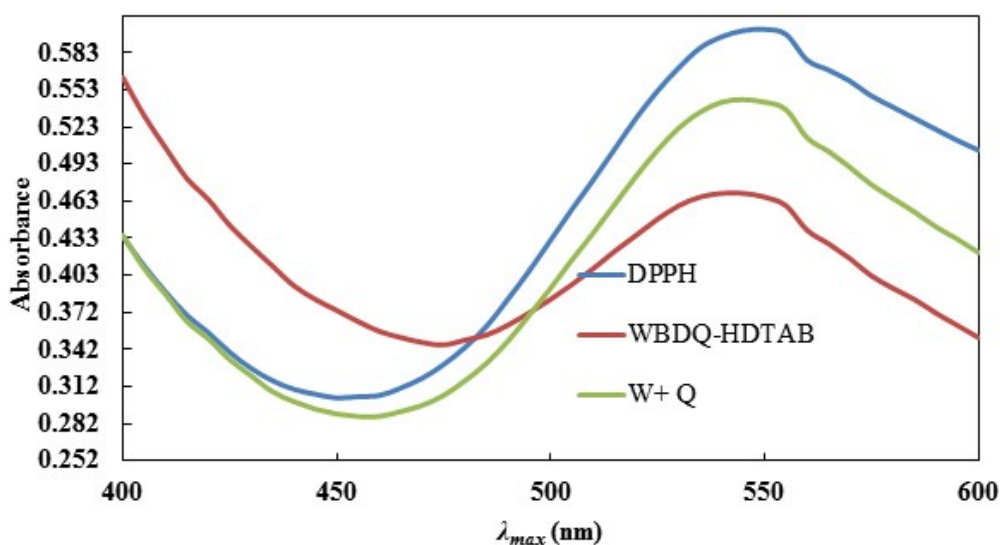


Fig. S6 Scavenging activity of quercetin with (WBDQ-HDTAB) and without (W+Q).

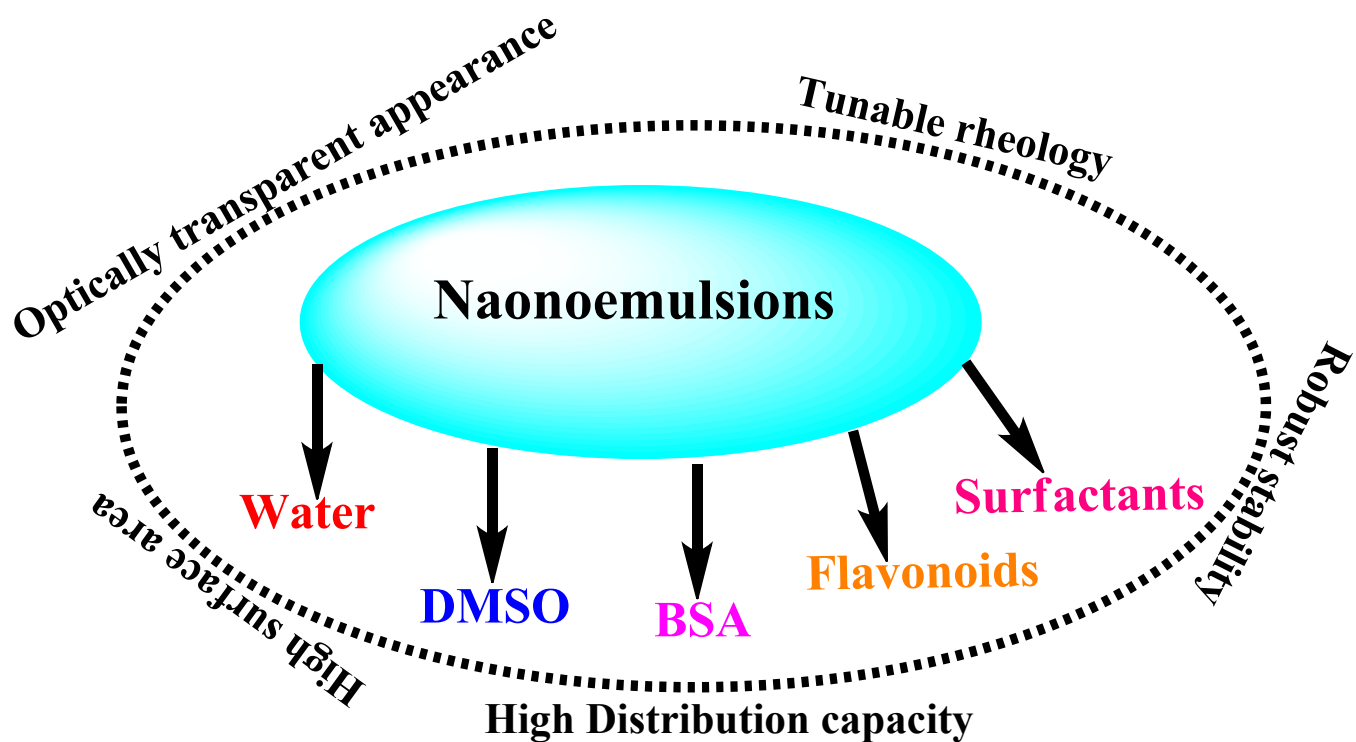


Fig. S7 Composition of nanoemulsions and their properties.

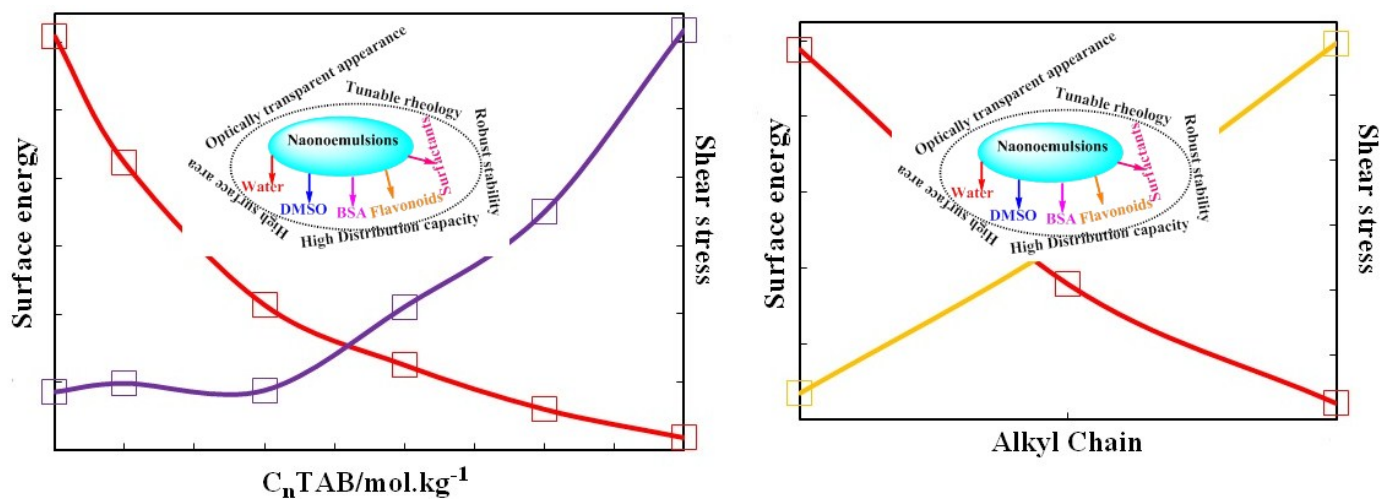


Fig. S8 The surface energy and shear stress of increasing concentration and carbon number of C_nTAB with WBD system.

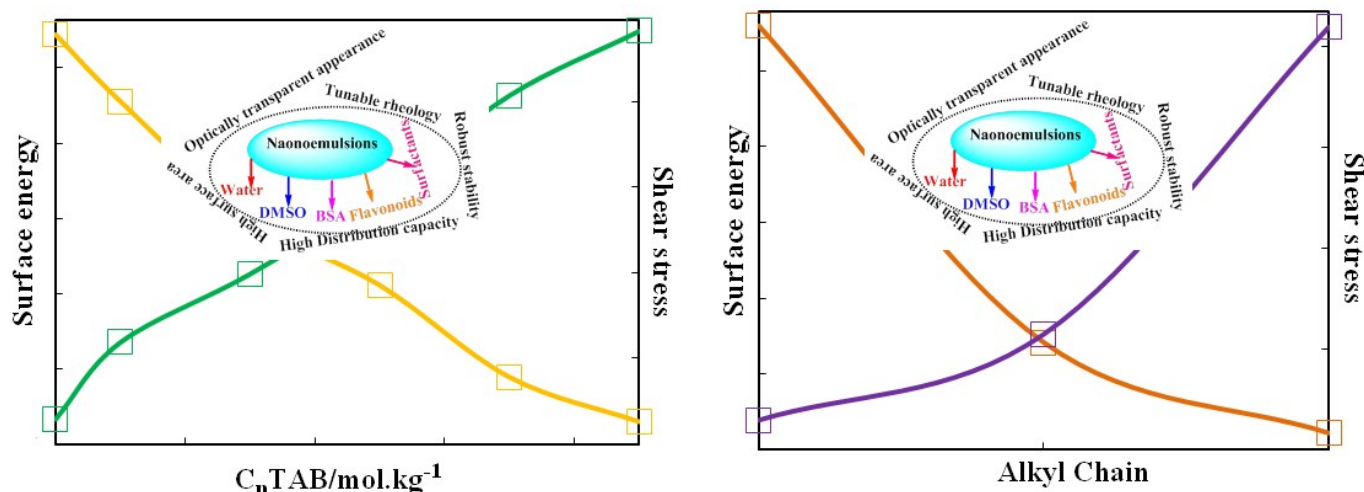


Fig. S9 The surface energy and shear stress of increasing concentration and carbon number of C_n TAB with Flavonoid-WBD system.

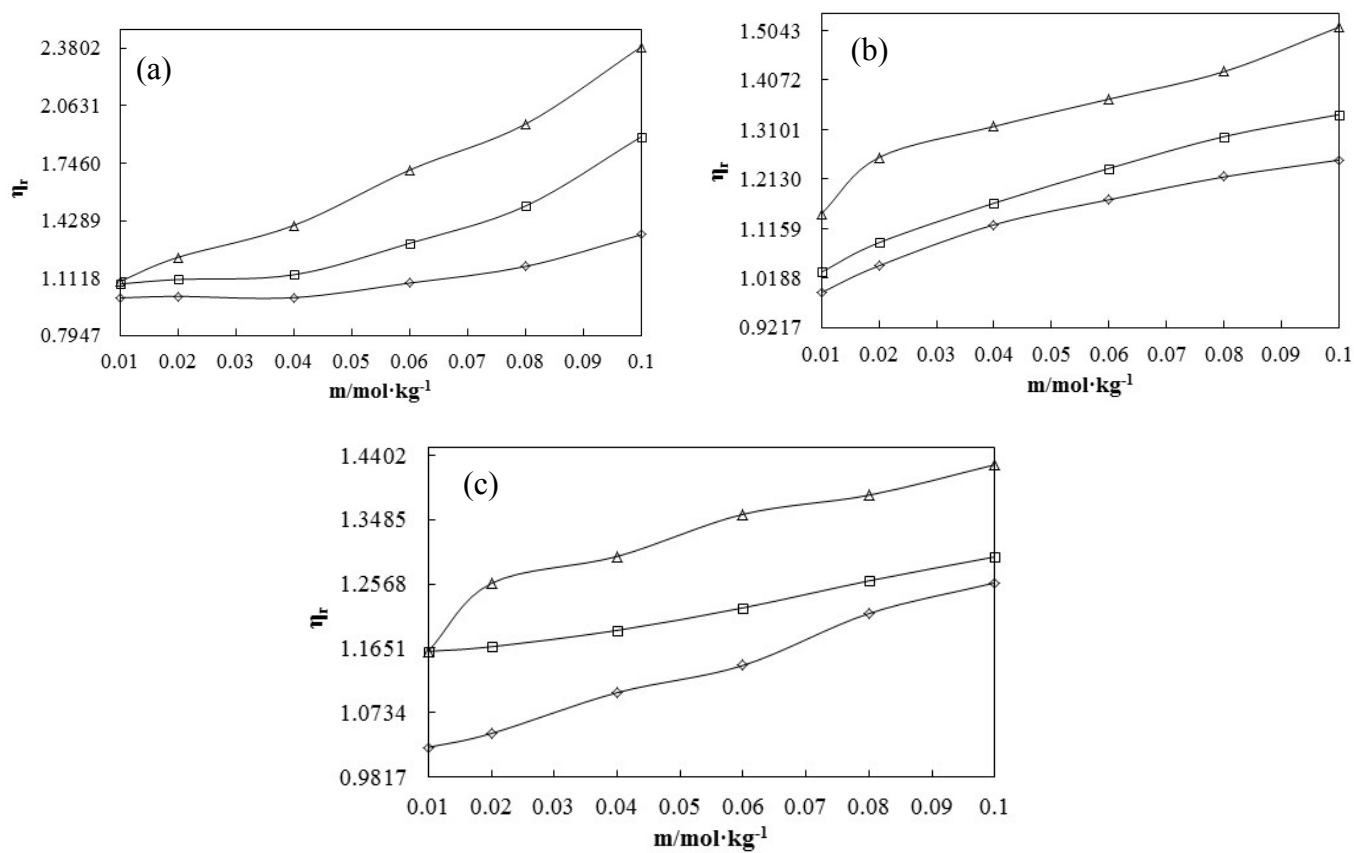


Fig. S10 The η_r of WBD with DTAB (◇), TDTAB (□) and HDTAB (Δ) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

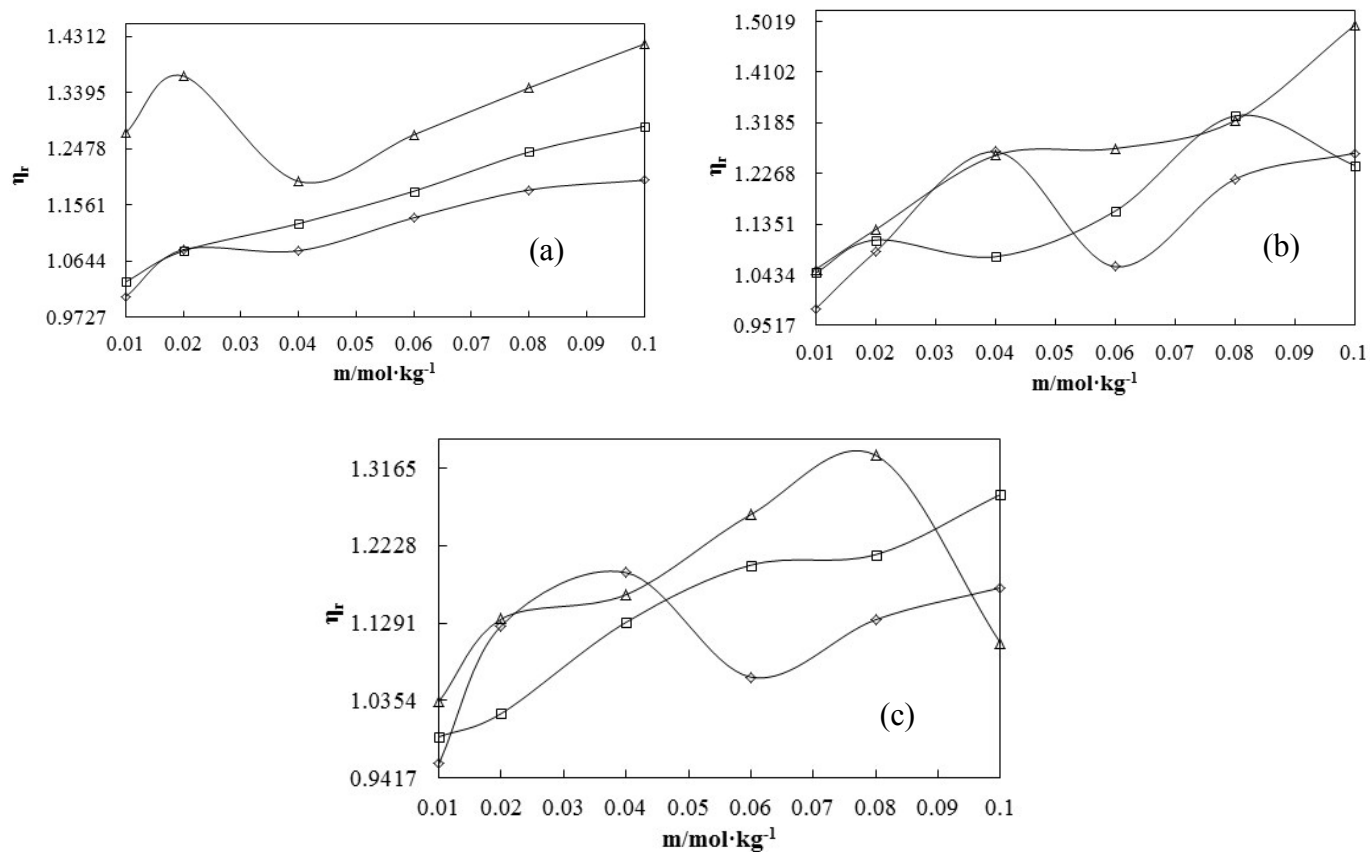


Fig. S11 The η_r of WBDQ with DTAB ($\diamond$), TDTAB ($\square$) and HDTAB (Δ) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

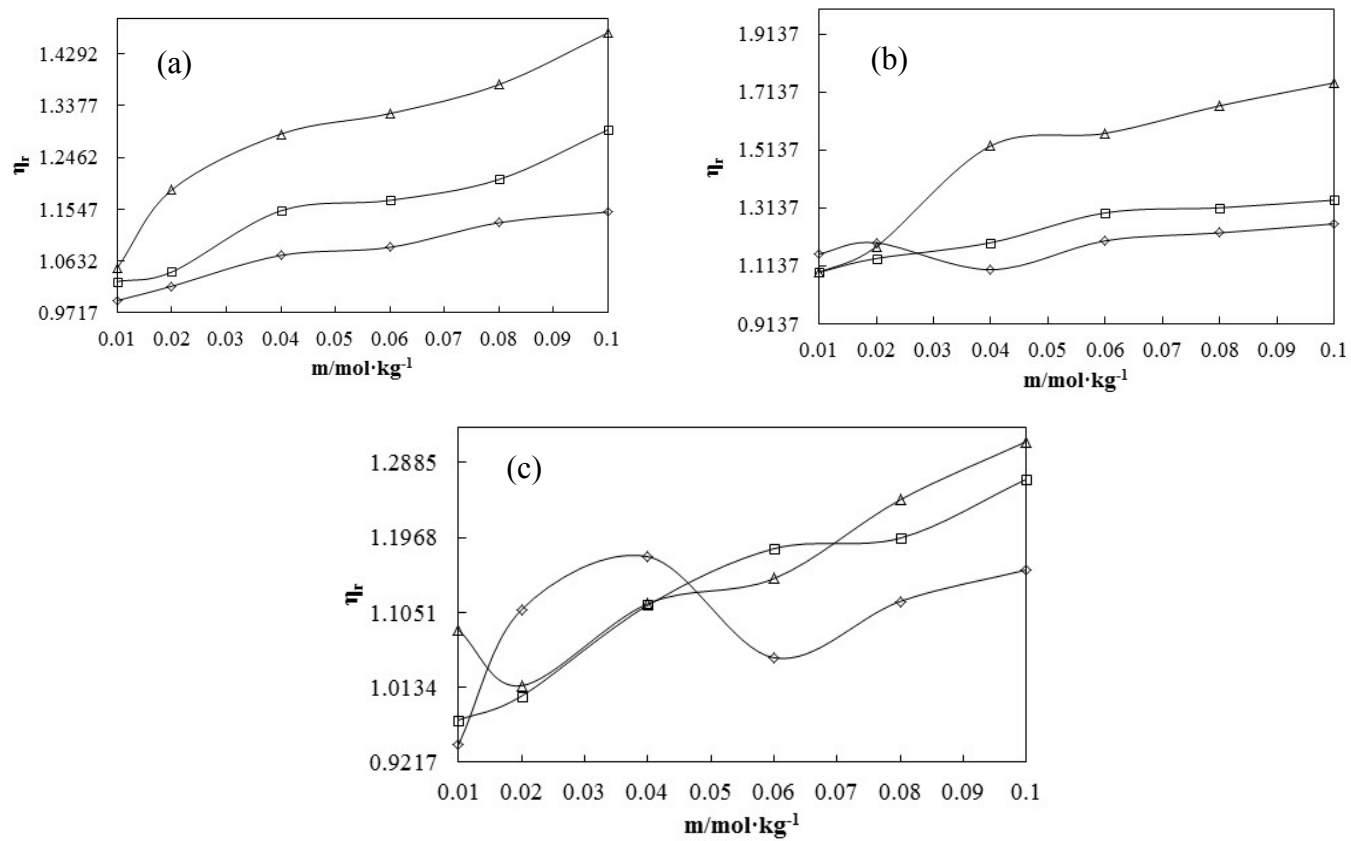


Fig. S12 The η_r of WBDA with DTAB ($\diamond$), TDTAB ($\square$) and HDTAB (Δ) at $T = 298.15$ (a), 303.15(b) and 308.15 K (c) respectively.

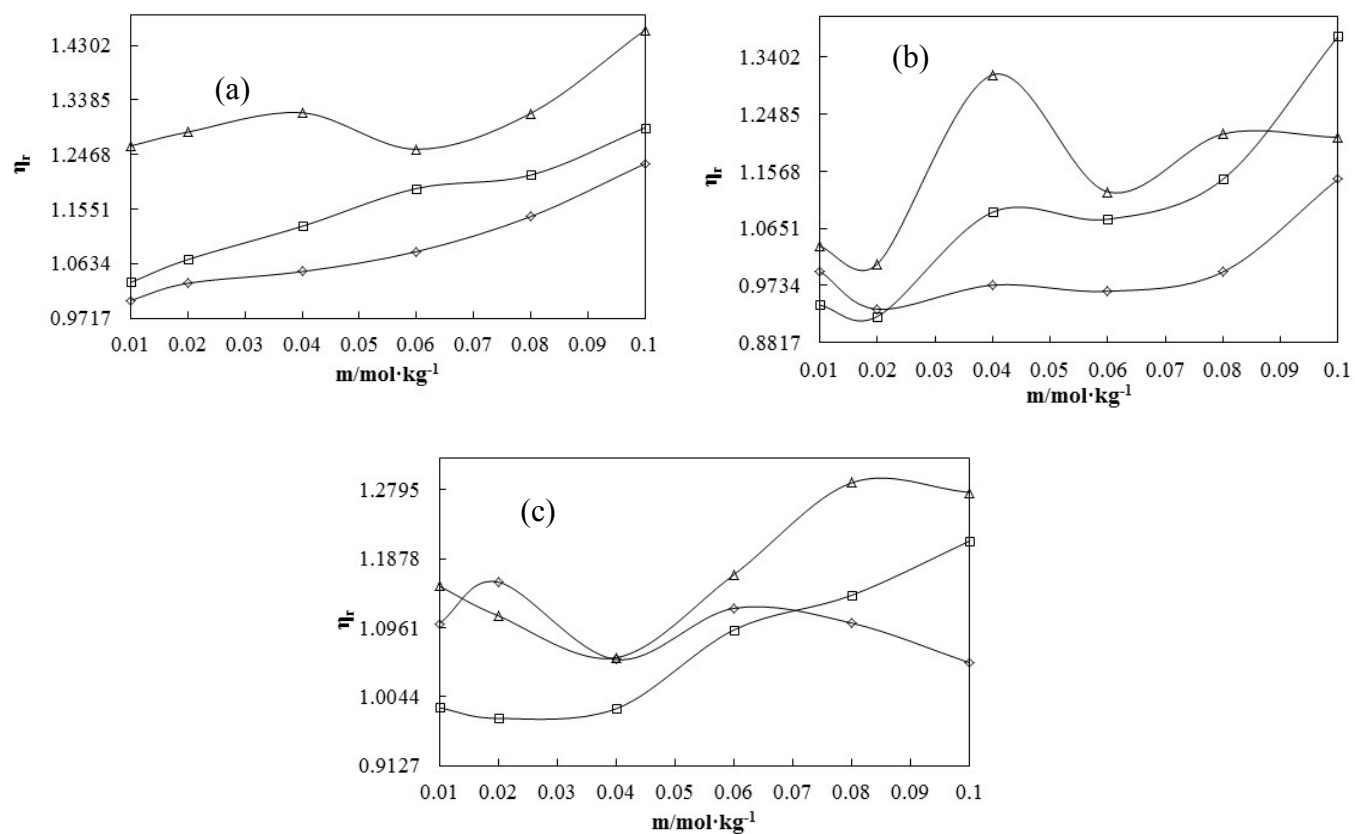


Fig. S13 The η_r of WBDN with DTAB ($\diamond$), TDTAB ($\square$) and HDTAB (Δ) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

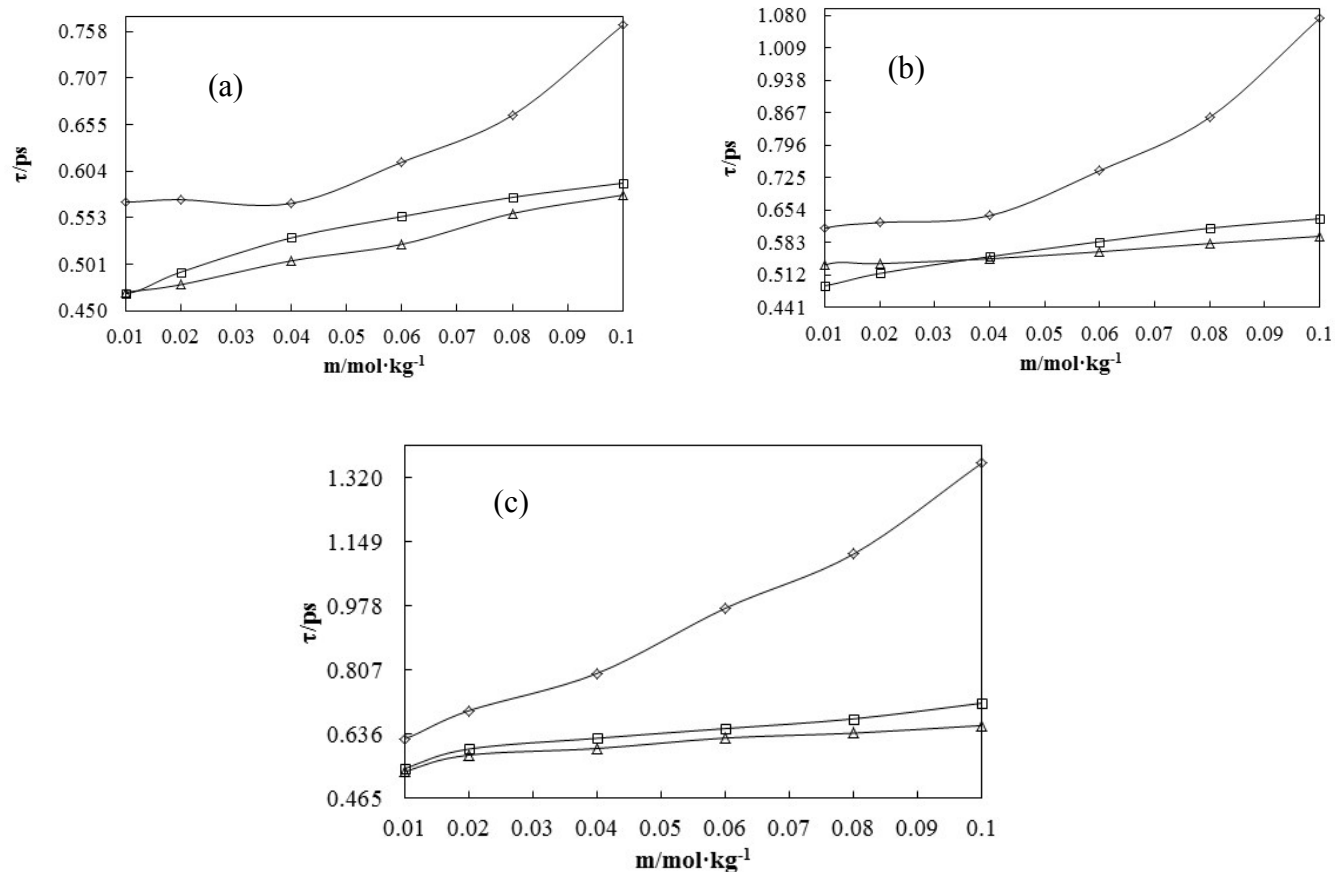


Fig. S14 The τ of WBD with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.

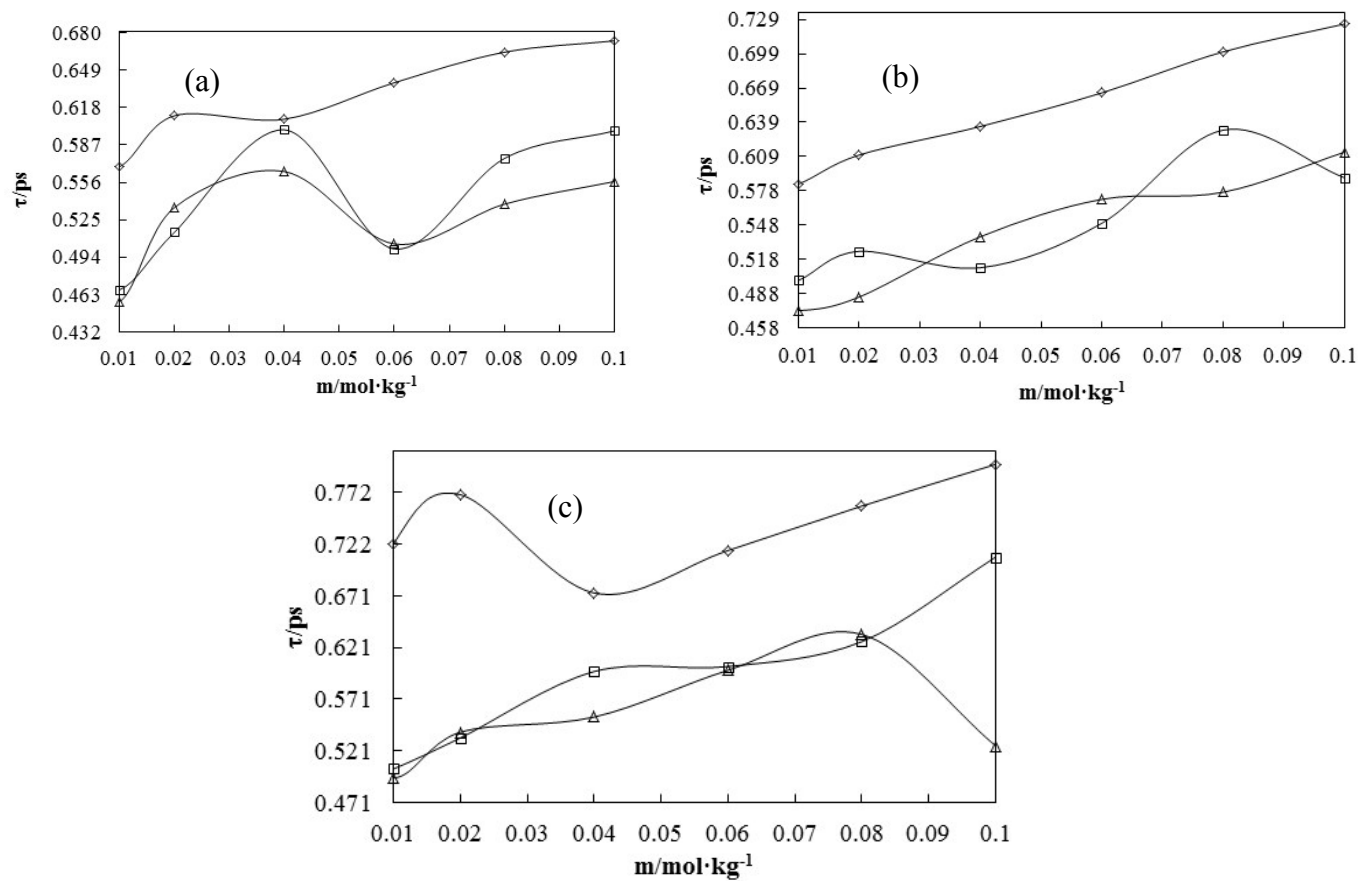


Fig. S15 The τ of WBDQ with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and 308.15 K (Δ) respectively.

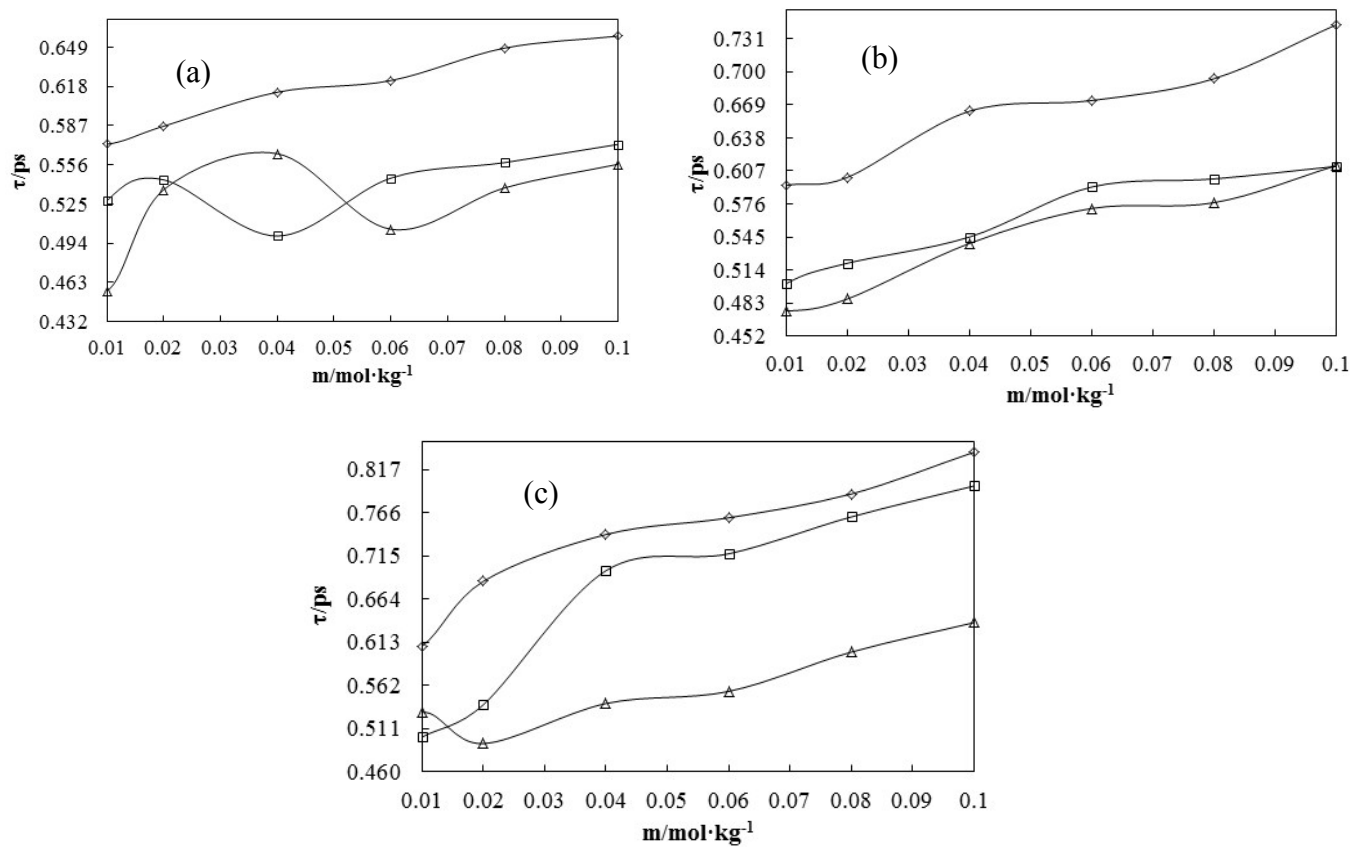


Fig. S16 The τ of WBDA with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and 308.15 K (Δ) respectively.

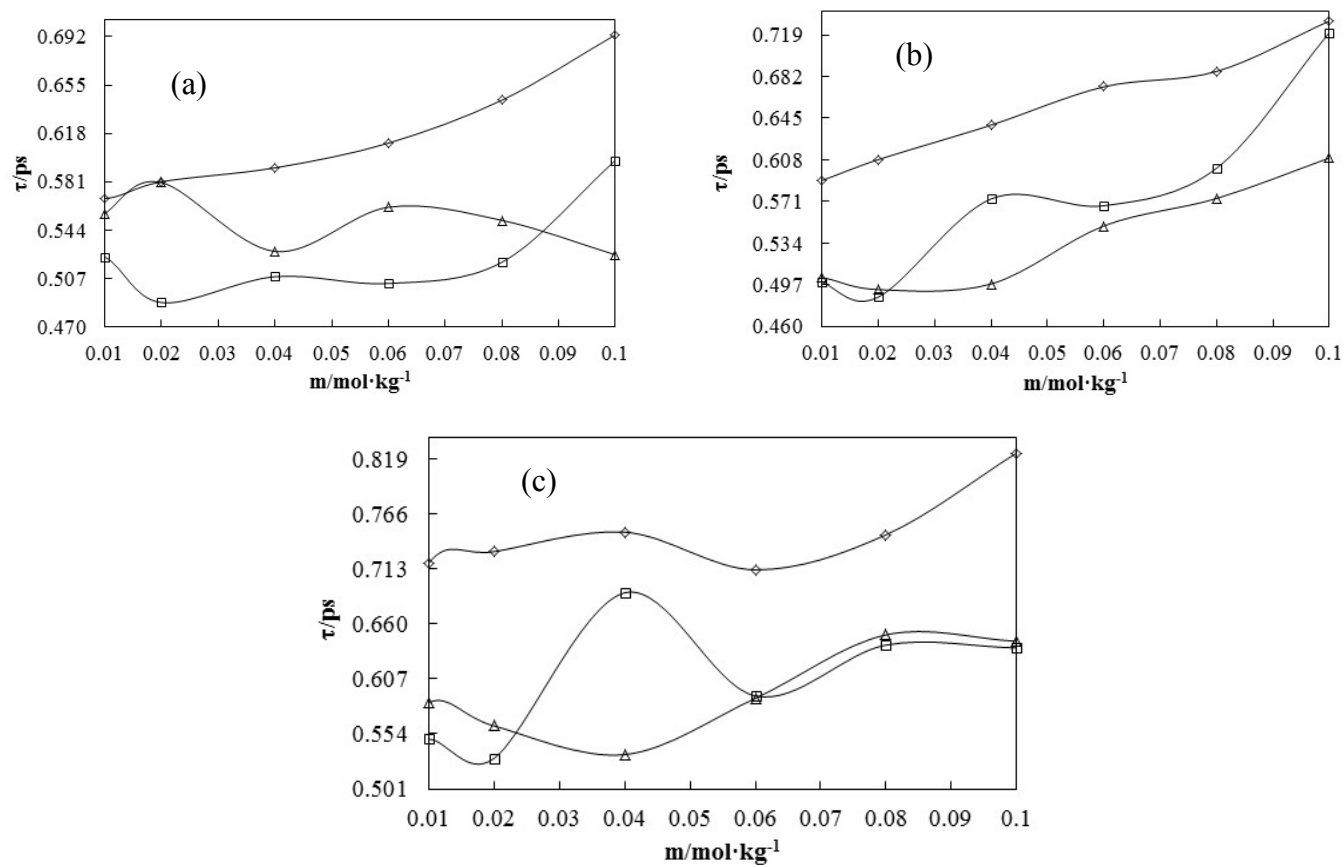


Fig. S17 The τ of WBDN with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and 308.15 K (Δ) respectively.

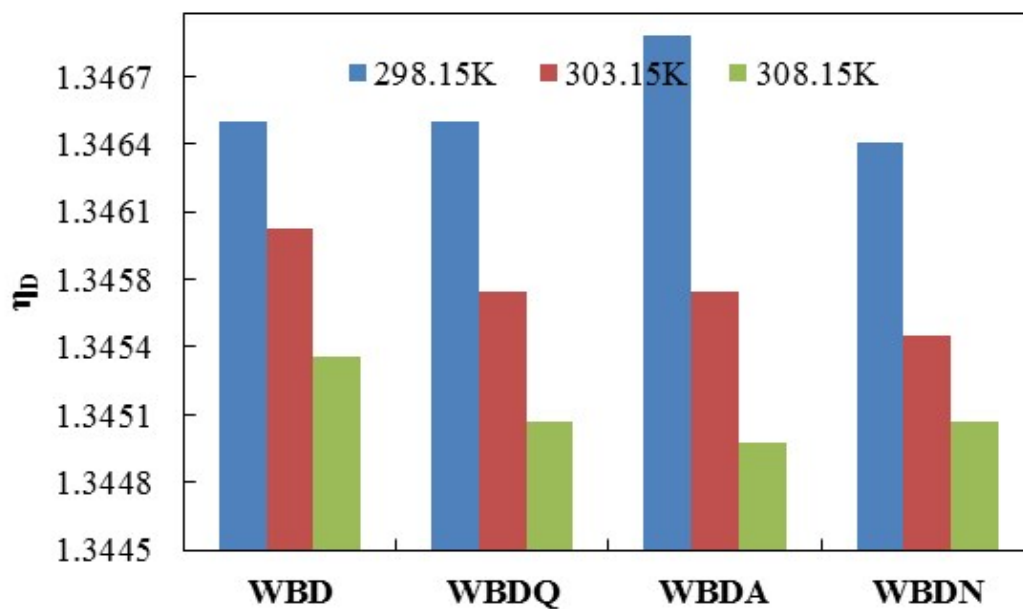


Fig. S18 The n_D of WBD, WBDQ, WBDA and WBDN at $T = 298.15(\diamond)$, $303.15(\square)$ and 308.15 K (Δ) respectively.

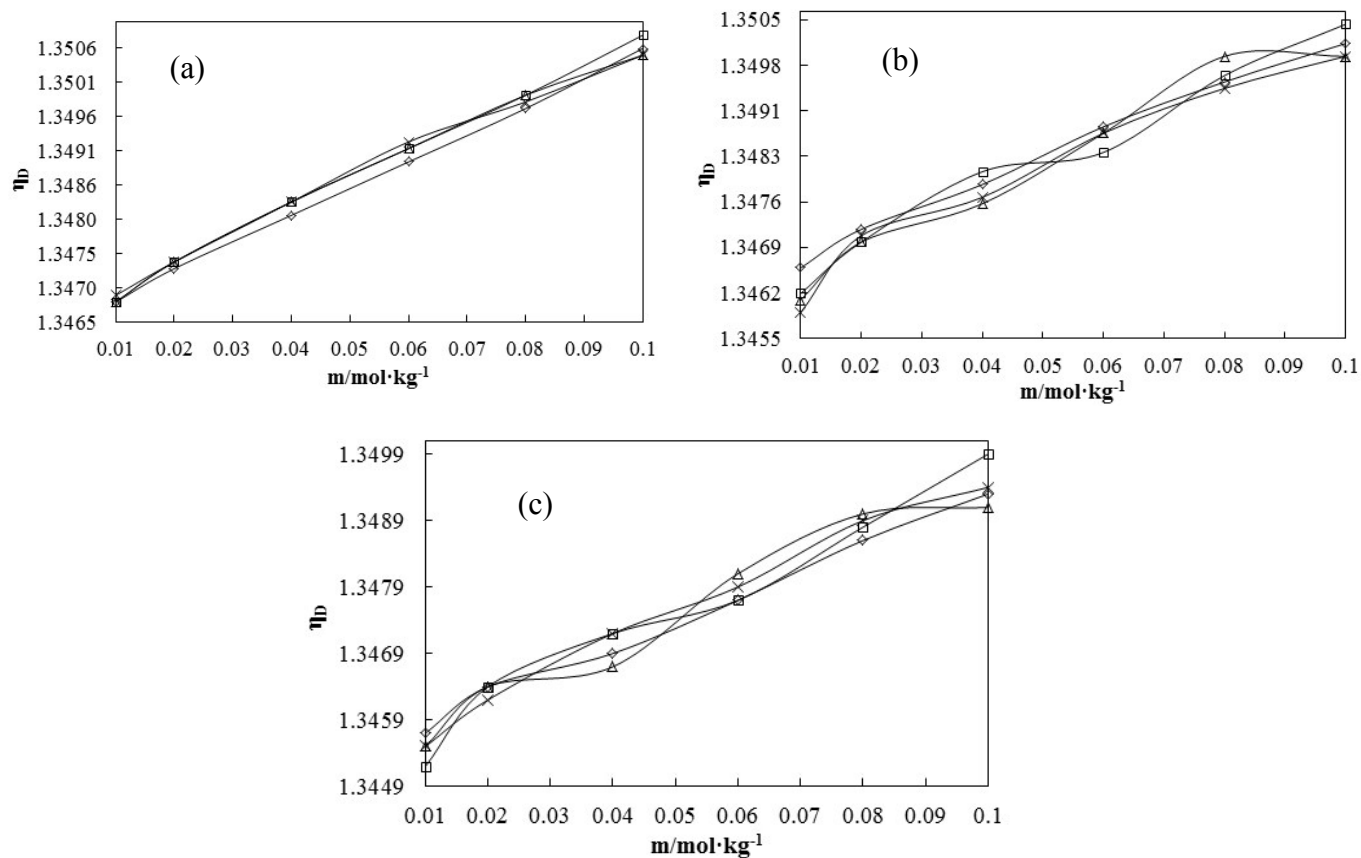


Fig. S19 The n_D of DTAB with WBD ($\diamond$), WBDQ ($\square$), WBDA (Δ) and WBDN ($\times$) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

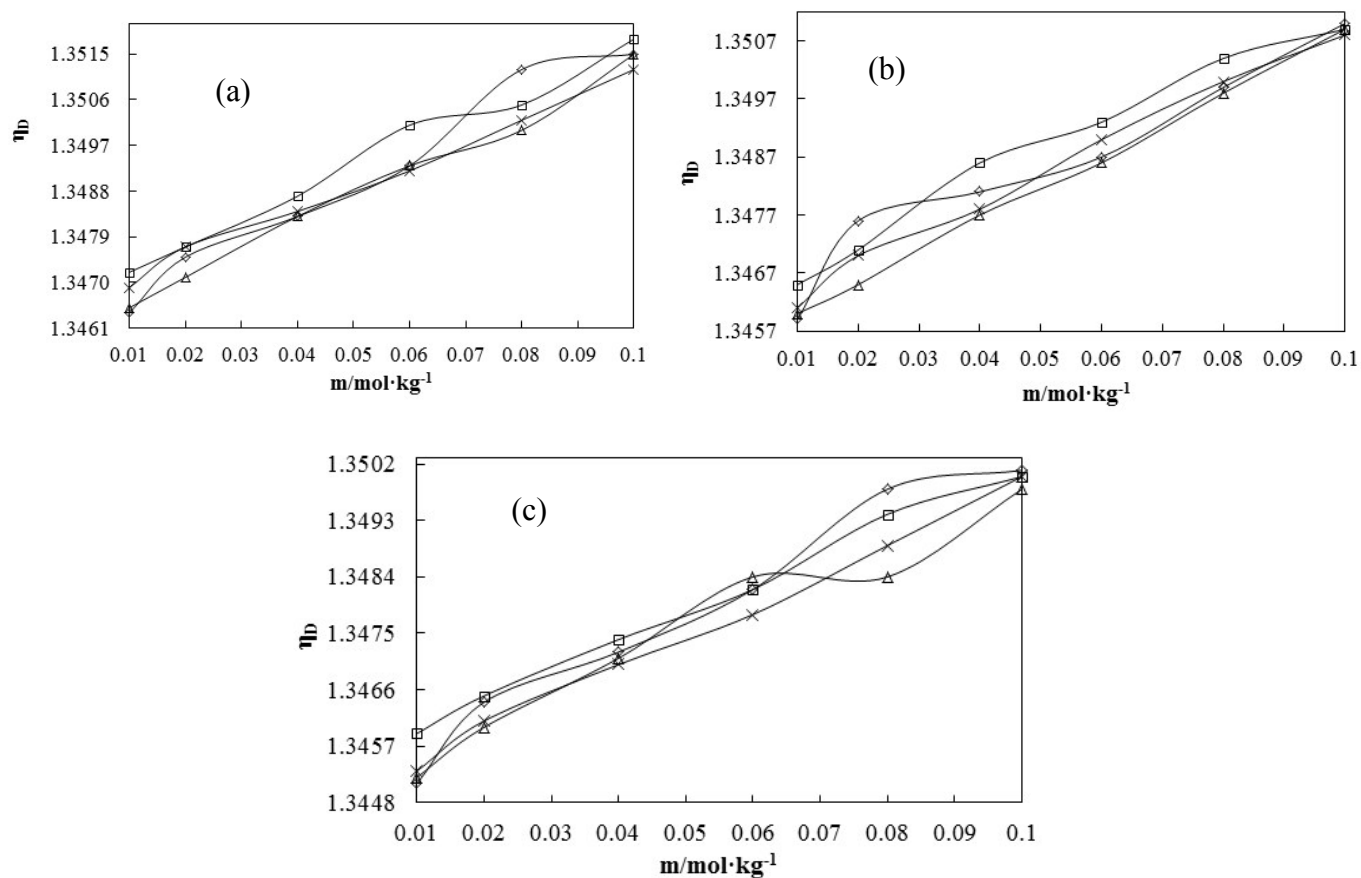


Fig. S20 The n_D of TDTAB with WBD ($\diamond$), WBDQ ($\square$), WBDA (Δ) and WBDN ($\times$) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

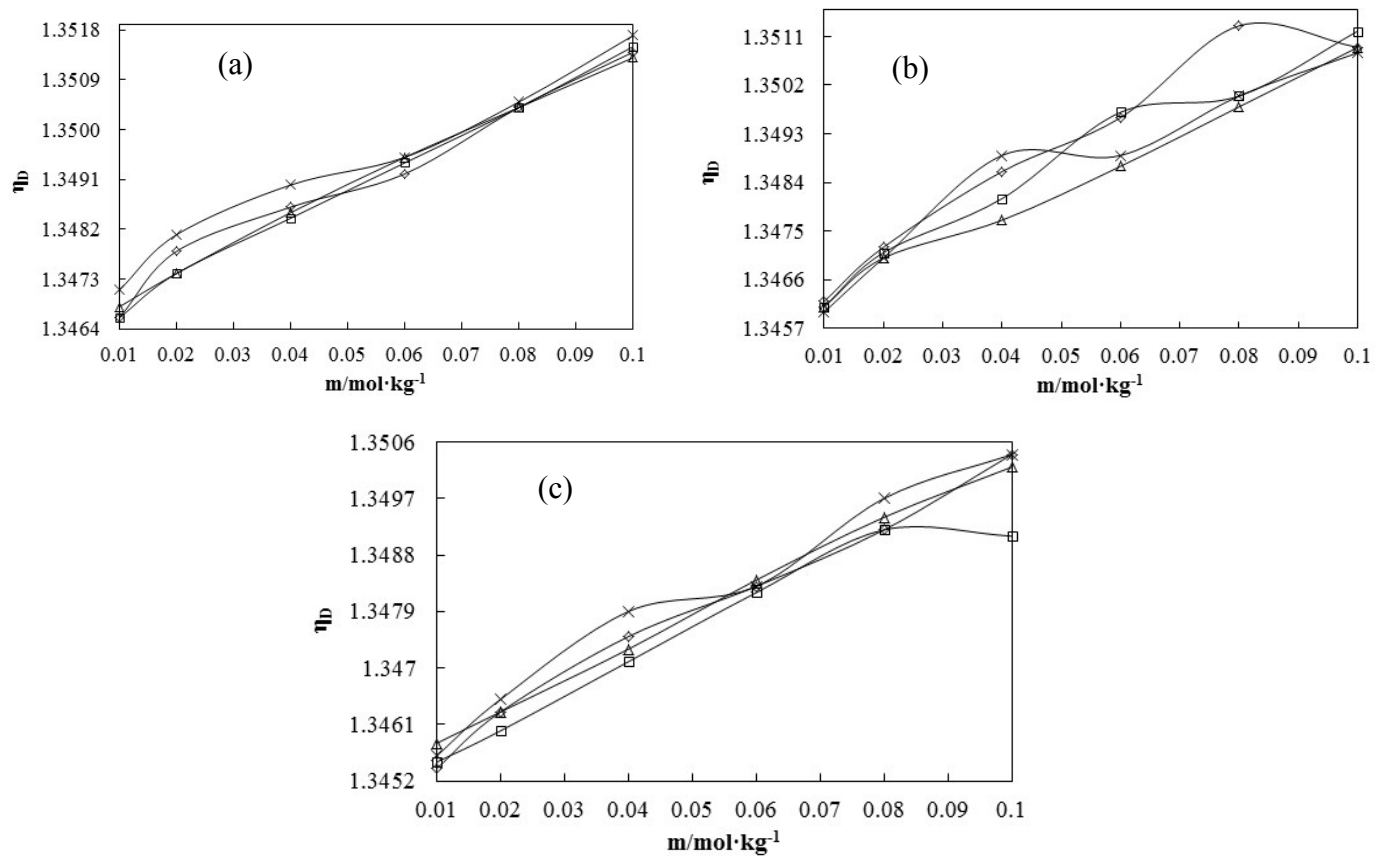


Fig. S21 The n_D of HDTAB with WBD ($\diamond$), WBDQ ($\square$), WBDA (Δ) and WBDN ($\times$) at $T = 298.15$ (a), 303.15 (b) and 308.15 K (c) respectively.

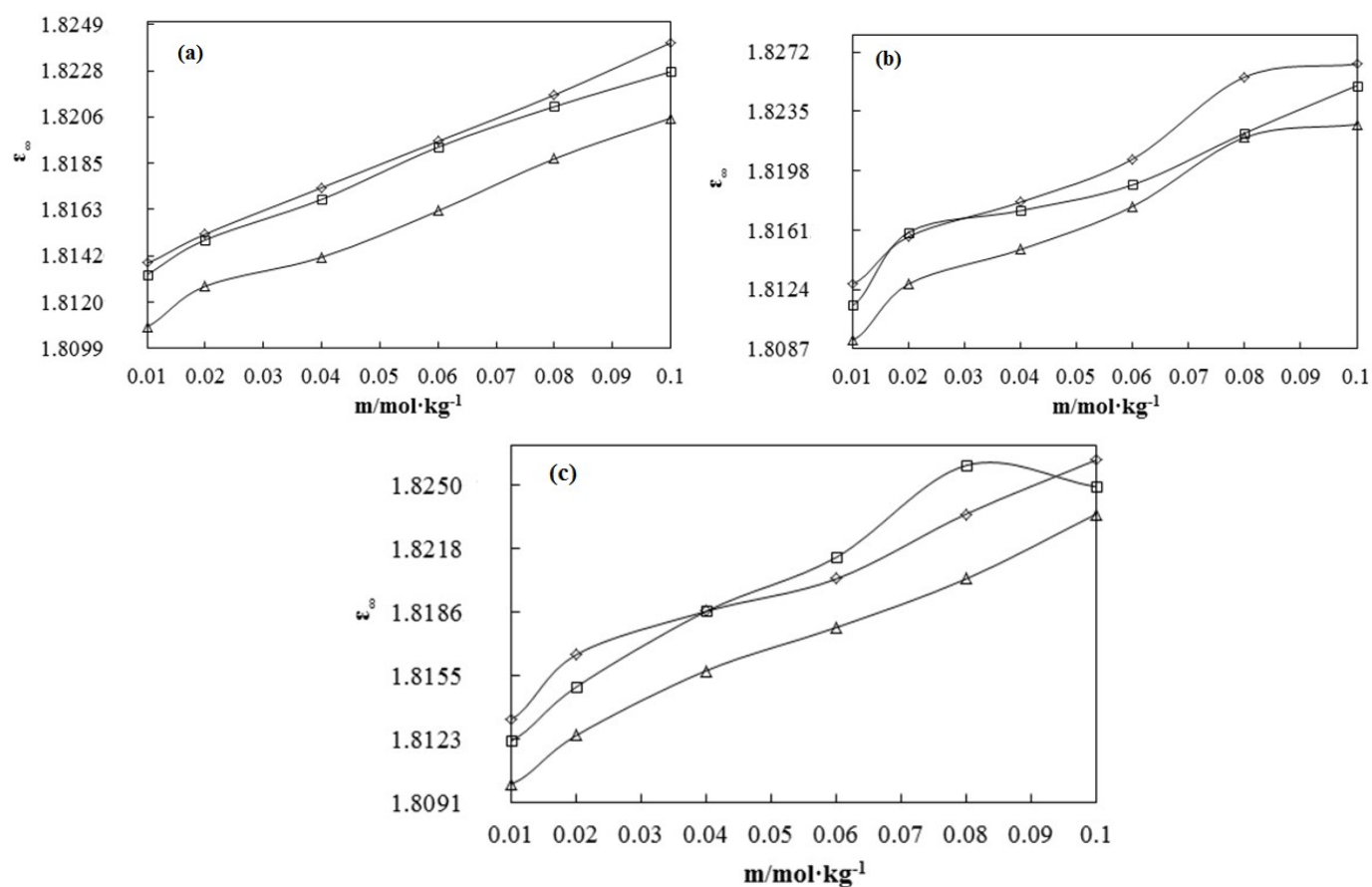


Fig. S22 The ϵ_{∞} of WBD with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.

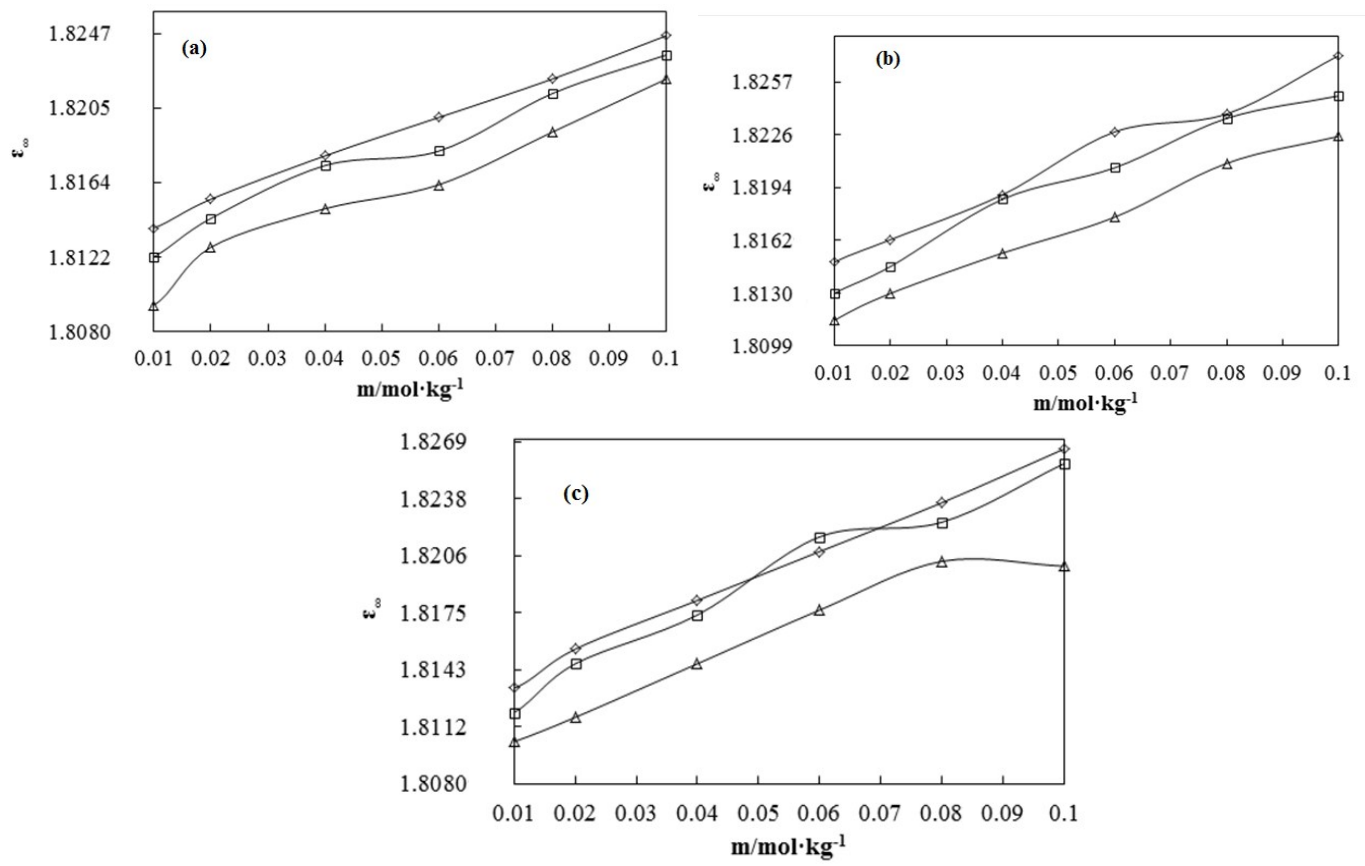


Fig. S23 The ϵ_{∞} of WBDQ with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.

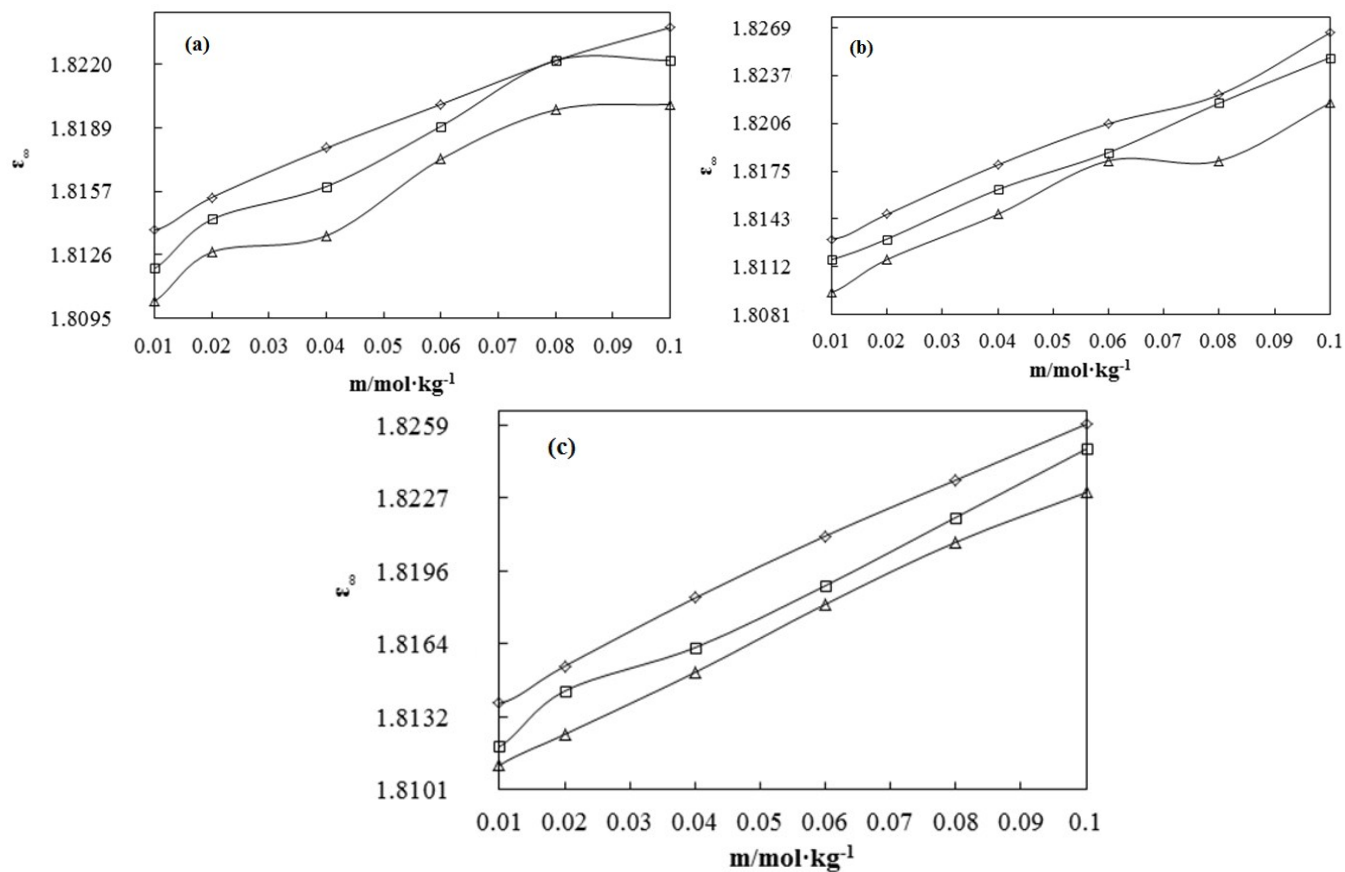


Fig. S24 The ϵ_{∞} of WBDA with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.

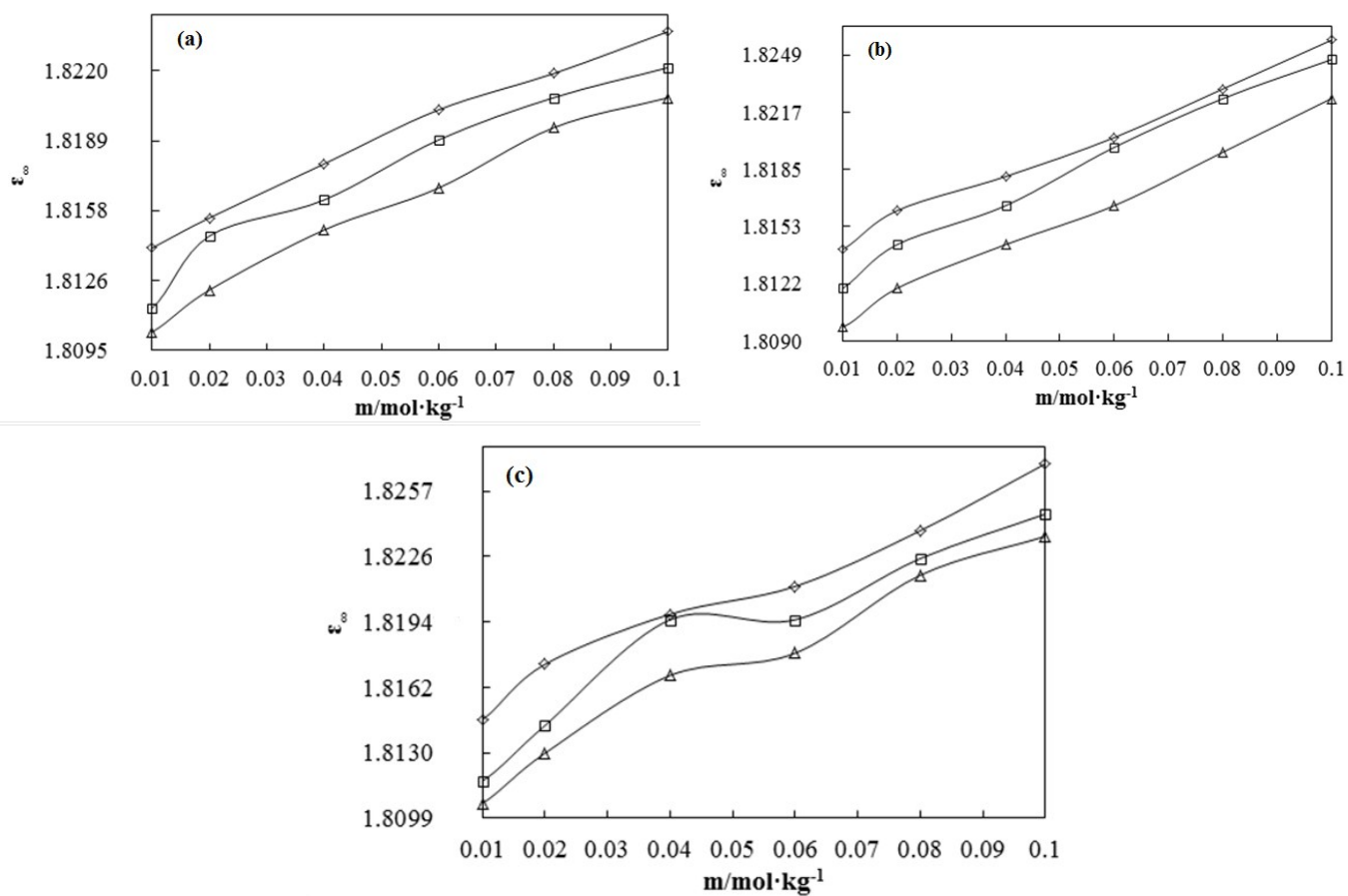


Fig. S25 The ϵ_∞ of WBDN with DTAB (a), TDTAB (b) and HDTAB (c) at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.

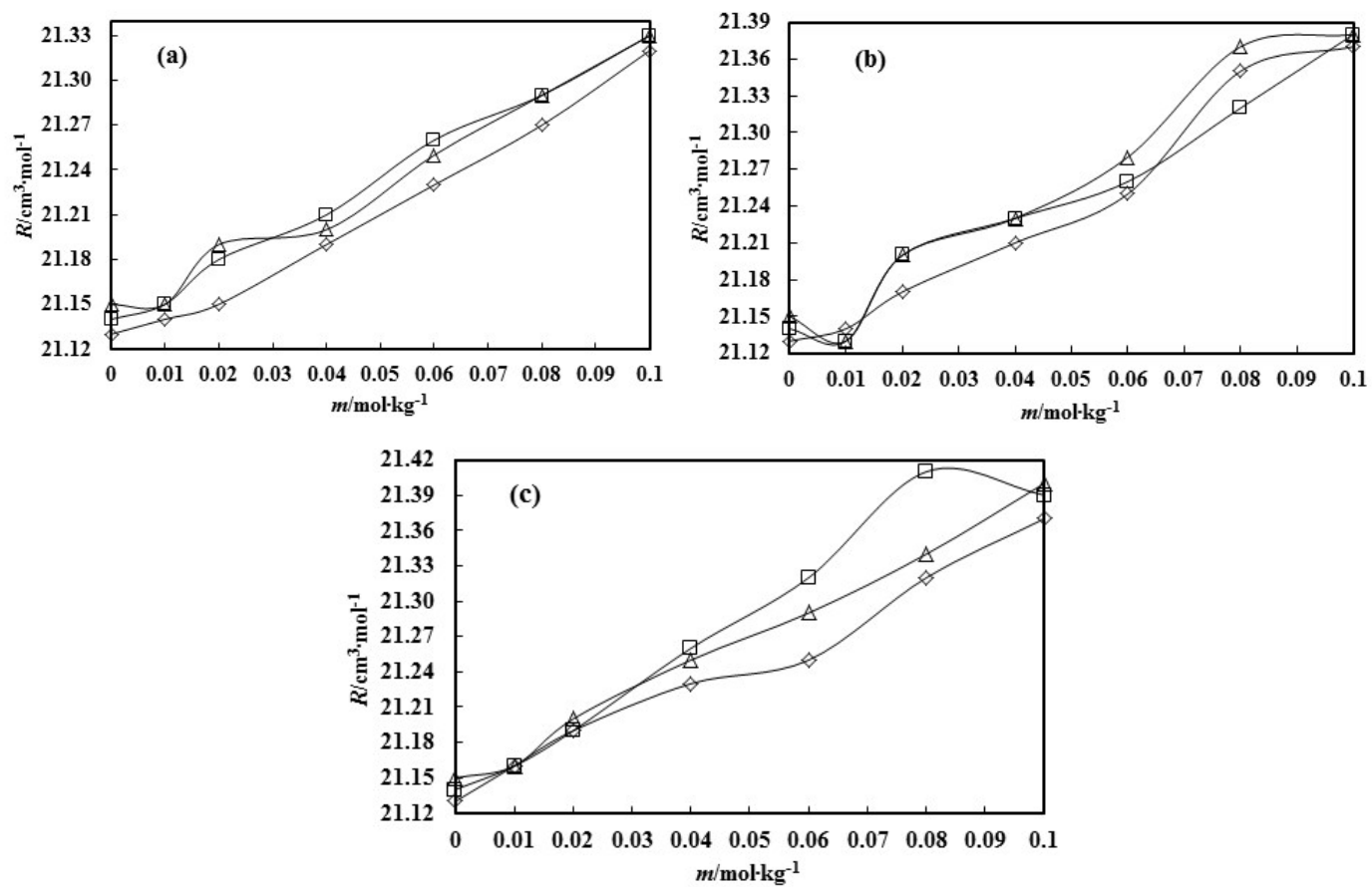


Fig. S26 The R value of DTAB (a), TDTAB (b) and HDTAB (c) with WBD at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15 \text{ K} (\Delta)$ respectively.

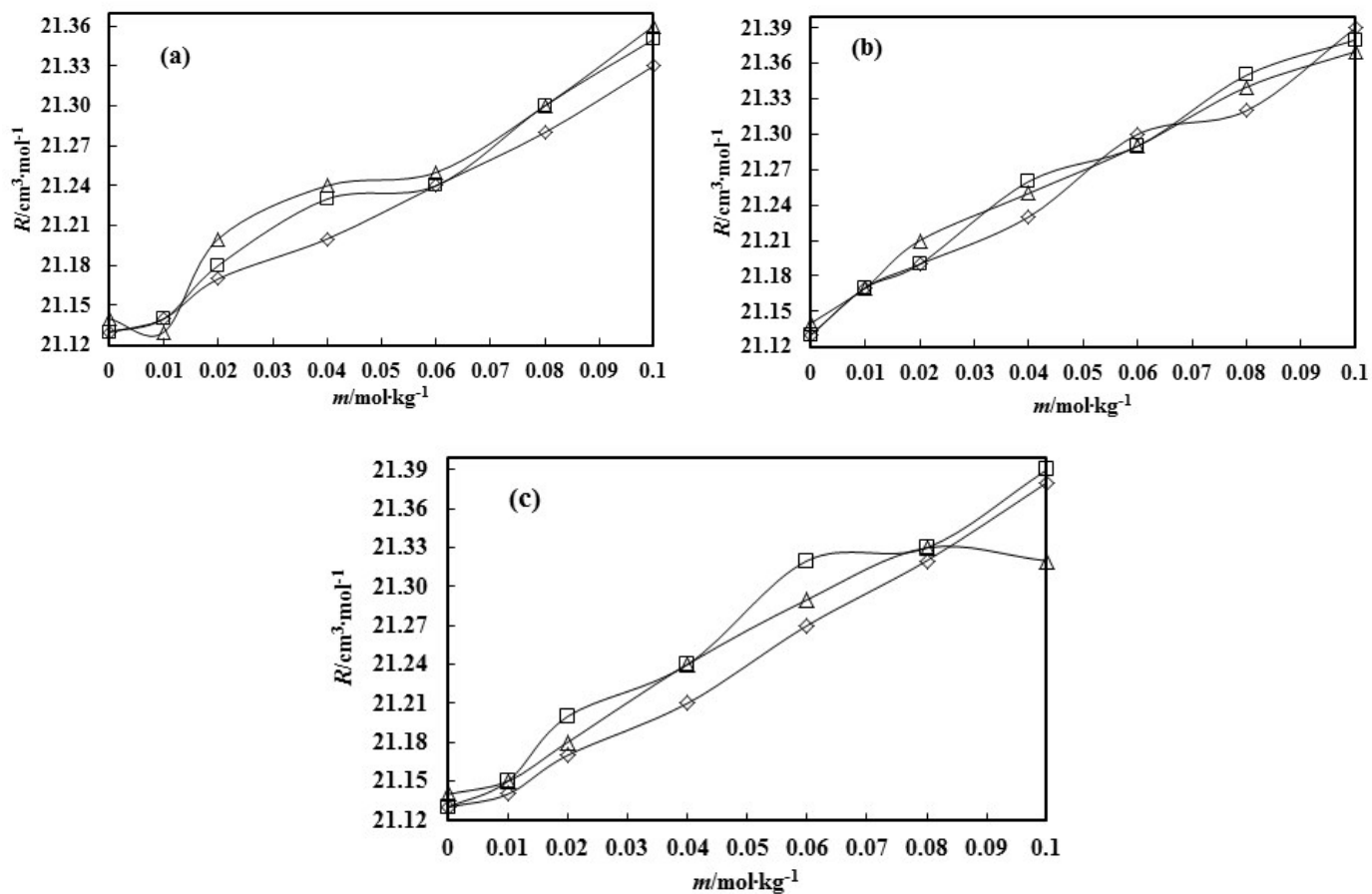


Fig. S27 The R value of DTAB (a), TDTAB (b) and HDTAB (c) with WBDQ at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15 \text{ K} (\Delta)$ respectively.

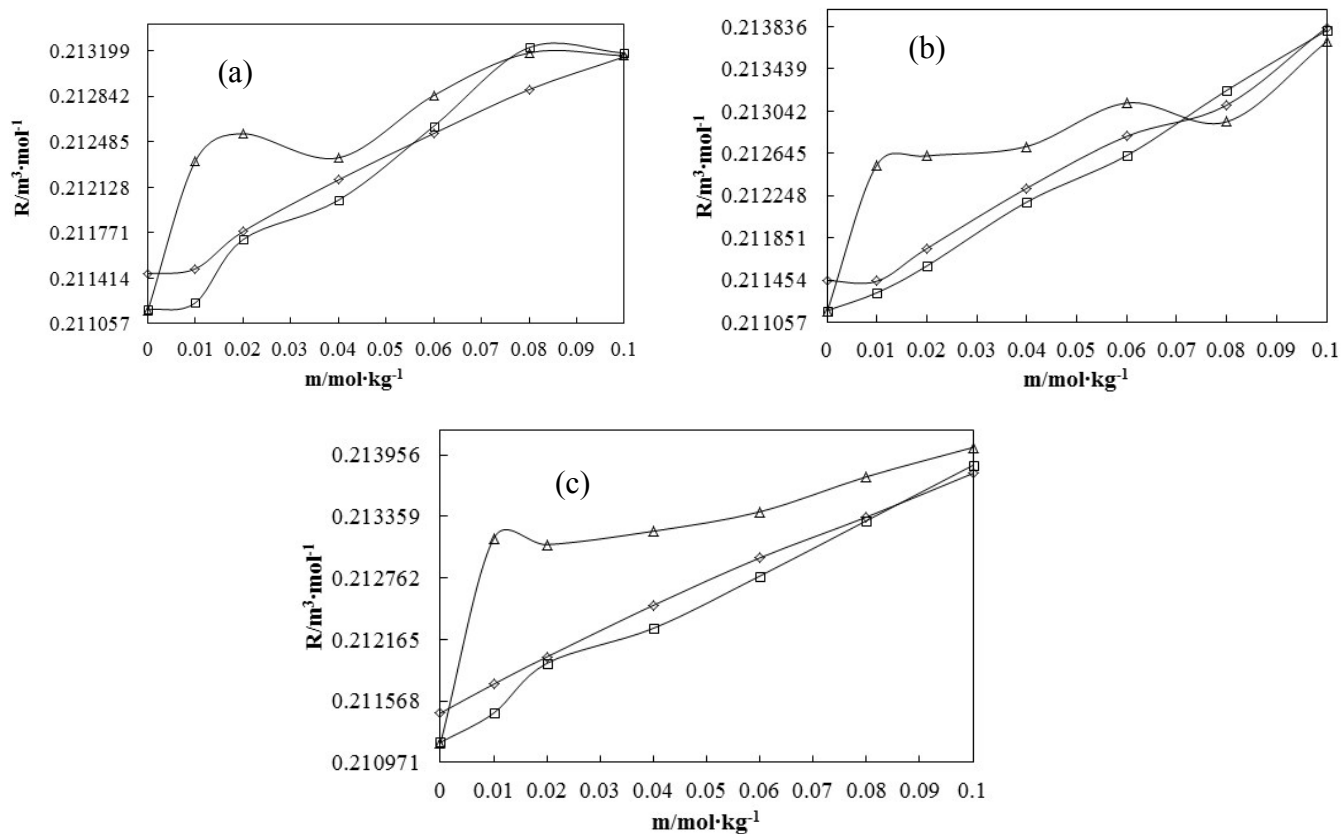


Fig. S28 The R value of DTAB (a), TDTAB (b) and HDTAB (c) with WBDA at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15 \text{ K} (\Delta)$ respectively.

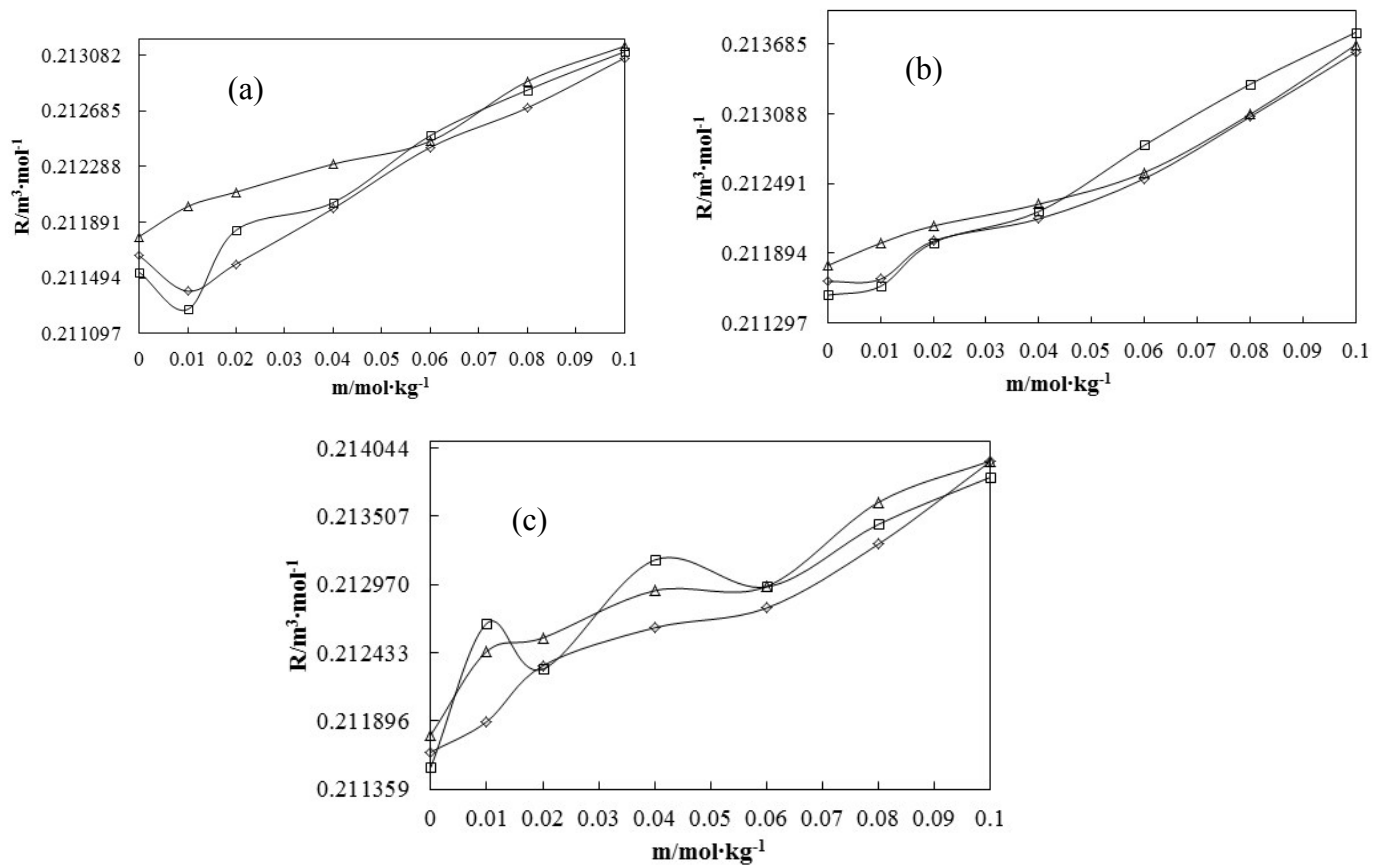


Fig. S29 The R value of DTAB (a), TDTAB (b) and HDTAB (c) with WBDN at $T = 298.15(\diamond)$, $303.15(\square)$ and $308.15\text{ K}(\Delta)$ respectively.