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Supplementary Information

Volumetric, acoustic, viscometric, calorimetric and spectroscopic studies to elucidate the effect of citrate and tartrate based food preservatives on the solvation behavior of acidic amino acids at different temperatures

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Table S1 Apparent molar volumes, $V_{2,\phi}$, of L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate at $T/K = 288.15$ to 323.15 and $P = (101.3 \text{ kPa})$.

$m_A/\text{mol}\cdot\text{kg}^{-1}$	$10^6 \cdot V_{2,\phi} / \text{m}^3\cdot\text{mol}^{-1}$							
	288.15K	293.15K	298.15K	303.15K	308.15 K	313.15K	318.15K	323.15K
L- Aspartic acid in water								
0.00517	71.96	72.28	72.53	72.72	72.90	73.12	73.40	73.58
0.00712	72.07	72.39	72.65	72.77	72.96	73.17	73.45	73.66
0.00921	72.14	72.40	72.79	72.92	73.04	73.22	73.50	73.75
0.01109	72.22	72.50	72.85	72.95	73.07	73.30	73.58	73.79
0.01300	72.32	72.62	72.91	72.98	73.13	73.34	73.64	73.82
0.01506	72.42	72.76	72.95	73.06	73.22	73.37	73.67	73.87
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.00502	75.18	75.30	75.50	75.55	75.66	75.71	75.79	75.86
0.00741	75.26	75.36	75.53	75.64	75.68	75.75	75.83	75.90
0.01180	75.32	75.44	75.58	75.67	75.76	75.82	75.90	75.95
0.01306	75.41	75.52	75.62	75.69	75.80	75.87	75.98	76.00
0.01732	75.50	75.58	75.65	75.75	75.82	75.92	76.04	76.11
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.00584	76.20	76.41	76.60	76.66	76.78	76.90	77.00	77.11

0.00817	76.26	76.45	76.64	76.75	76.82	76.94	77.08	77.20
0.01106	76.33	76.50	76.67	76.80	76.86	77.00	77.13	77.29
0.01337	76.38	76.56	76.73	76.85	76.90	77.08	77.20	77.36
0.01555	76.43	76.64	76.79	76.89	76.96	77.12	77.26	77.43
0.01667	76.51	76.70	76.81	76.93	77.02	77.18	77.29	77.47
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.00638	77.53	77.60	77.69	77.83	77.91	78.00	78.13	78.19
0.00782	77.63	77.67	77.77	77.85	77.95	78.04	78.17	78.24
0.00982	77.75	77.75	77.83	77.90	77.97	78.14	78.30	78.30
0.01307	77.85	77.82	77.85	77.92	78.05	78.21	78.36	78.39
0.01509	77.91	77.89	77.88	77.98	78.11	78.28	78.41	78.46
0.01 539	77.98	77.95	77.91	78.06	78.15	78.32	78.45	78.50
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.00547	78.48	78.64	78.85	78.97	79.06	79.08	79.24	79.37
0.00739	78.49	78.65	78.92	79.00	79.11	79.20	79.33	79.45
0.01025	78.50	78.66	79.01	79.06	79.21	79.29	79.41	79.54
0.01347	78.51	78.71	79.04	79.15	79.29	79.38	79.50	79.66
0.01664	78.53	78.77	79.18	79.24	79.38	79.44	79.56	79.81
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.00576	76.62	76.80	77.01	77.11	77.15	77.21	77.33	77.38
0.00754	76.68	76.84	77.05	77.14	77.26	77.23	77.36	77.44
0.01002	76.74	76.87	77.07	77.26	77.30	77.27	77.40	77.49
0.01189	76.79	76.92	77.10	77.28	77.37	77.32	77.45	77.54
0.01520	76.83	76.96	77.17	77.33	77.43	77.35	77.50	77.60
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.00624	77.31	77.52	77.68	77.80	77.97	78.12	78.28	78.36
0.00784	77.35	77.59	77.69	77.83	78.02	78.19	78.35	78.41
0.01080	77.39	77.65	77.70	77.85	78.05	78.21	78.47	78.51
0.01208	77.42	77.71	77.74	77.87	78.16	78.27	78.57	78.56
0.01490	77.47	77.74	77.76	77.90	78.20	78.36	78.60	78.61
0.01825	77.53	77.80	77.80	77.96	78.32	78.46	78.65	78.73
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.00597	78.38	78.60	78.80	78.93	78.98	79.11	79.20	79.26
0.00809	78.44	78.65	78.82	78.94	79.06	79.18	79.29	79.33

0.00985	78.49	78.68	78.84	78.96	79.09	79.22	79.35	79.42
0.01284	78.56	78.73	78.87	78.99	79.16	79.25	79.40	79.49
0.01520	78.59	78.77	78.93	79.05	79.25	79.30	79.46	79.52
0.01810	78.66	78.86	78.96	79.12	79.29	79.39	79.56	79.62
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.00626	79.42	79.57	79.76	79.87	79.91	79.94	80.00	80.07
0.00788	79.50	79.64	79.78	79.90	79.93	79.97	80.04	80.17
0.01082	79.59	79.68	79.80	79.93	79.95	79.99	80.11	80.24
0.01180	79.66	79.71	79.84	79.95	79.97	80.03	80.14	80.29
0.01461	79.70	79.78	79.89	80.00	80.02	80.07	80.19	80.34
0.01732	79.81	79.86	79.95	80.08	80.10	80.16	80.23	80.38
L-Glutamic acid in water								
0.01104	88.54	88.97	89.80	90.24	90.75	91.38	91.62	92.09
0.01308	88.57	89.09	89.86	90.26	90.80	91.48	91.67	92.14
0.01522	88.60	89.16	89.89	90.30	90.88	91.54	91.75	92.20
0.02078	88.72	89.28	89.94	90.43	90.92	91.62	91.79	92.28
0.02517	88.78	89.35	89.97	90.49	90.97	91.74	91.89	92.33
0.03030	88.88	89.44	90.04	90.62	91.01	91.80	91.95	92.47
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.01288	90.54	90.85	91.23	91.46	91.68	91.91	92.10	92.22
0.01523	90.63	90.91	91.38	91.54	91.77	91.93	92.21	92.41
0.01930	90.71	90.97	91.41	91.63	91.85	91.95	92.29	92.52
0.02496	90.79	91.09	91.48	91.71	91.94	92.01	92.36	92.60
0.03127	90.87	91.18	91.56	91.81	92.03	92.13	92.49	92.73
0.03591	90.94	91.28	91.63	91.95	92.17	92.21	92.64	92.83
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.01410	91.31	91.55	91.76	91.99	92.13	92.37	92.53	92.76
0.01537	91.39	91.60	91.80	92.04	92.22	92.41	92.60	92.83
0.01930	91.45	91.65	91.83	92.10	92.25	92.47	92.67	92.87
0.02391	91.50	91.74	91.89	92.17	92.35	92.53	92.75	92.94
0.03000	91.55	91.84	91.95	92.25	92.44	92.62	92.83	93.03
0.03235	91.60	91.88	92.05	92.39	92.48	92.67	92.89	93.15
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.01228	91.72	92.08	92.49	92.56	92.93	93.33	93.46	93.65

0.01354	91.78	92.14	92.51	92.68	93.00	93.36	93.49	93.77
0.01654	91.86	92.22	92.54	92.74	93.09	93.38	93.56	93.90
0.02018	91.91	92.29	92.61	92.86	93.16	93.41	93.61	93.98
0.02585	91.96	92.35	92.68	92.94	93.27	93.50	93.68	94.05
0.03703	92.11	92.61	92.78	93.08	93.42	93.66	93.79	94.23
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.01159	92.02	92.21	92.74	92.95	93.28	93.77	93.97	94.19
0.01375	92.08	92.29	92.87	93.05	93.32	93.84	94.04	94.31
0.01765	92.19	92.38	92.94	93.16	93.38	93.90	94.10	94.44
0.01995	92.23	92.42	93.00	93.25	93.44	93.97	94.20	94.52
0.02676	92.38	92.48	93.13	93.32	93.56	94.07	94.26	94.59
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.01247	92.02	92.25	92.30	92.42	92.55	92.69	92.87	93.05
0.01463	92.20	92.36	92.36	92.46	92.58	92.81	92.91	93.10
0.01634	92.29	92.42	92.41	92.50	92.60	92.90	92.97	93.18
0.02218	92.36	92.45	92.45	92.56	92.67	93.01	93.16	93.21
0.02857	92.49	92.64	92.56	92.68	92.79	93.10	93.27	93.31
0.03390	92.59	92.79	92.64	92.73	92.86	93.19	93.35	93.43
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.01213	92.43	92.57	93.01	93.16	93.50	93.71	93.82	93.90
0.01438	92.53	92.64	93.08	93.25	93.56	93.76	93.89	94.07
0.01771	92.58	92.69	93.13	93.31	93.60	93.80	94.08	94.16
0.02308	92.65	92.75	93.21	93.37	93.70	93.85	94.16	94.26
0.02531	92.72	92.81	93.24	93.44	93.80	93.91	94.25	94.35
0.03401	92.80	92.87	93.28	93.52	93.91	94.09	94.32	94.45
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.01104	93.39	93.51	93.91	94.04	94.32	94.58	94.85	94.93
0.01239	93.49	93.58	93.93	94.15	94.39	94.68	94.91	94.97
0.01547	93.57	93.65	93.94	94.23	94.47	94.72	94.98	95.02
0.02012	93.69	93.74	94.00	94.35	94.54	94.81	95.07	95.06
0.02521	93.81	93.80	94.09	94.43	94.60	94.90	95.23	95.11
0.03006	93.89	93.87	94.18	94.54	94.65	95.00	95.41	95.21
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.01088	94.26	94.38	94.78	94.89	95.03	95.34	95.44	95.74

0.01408	94.31	94.45	94.80	94.94	95.16	95.37	95.51	95.80
0.01532	94.35	94.56	94.82	95.01	95.24	95.39	95.57	95.85
0.02000	94.42	94.65	94.87	95.09	95.32	95.44	95.63	95.93
0.02799	94.54	94.71	94.95	95.15	95.45	95.56	95.72	96.04
0.03107	94.60	94.77	95.01	95.24	95.50	95.63	95.78	96.21

m_A is the molality of solute in water + DST/TSC. m_B is the molality of DST/TSC in water. Standard uncertainties, u are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4} \text{ mol} \cdot \text{kg}^{-1}$, $u(V_{2,\phi}) = 0.05$ to $1.3 \cdot 10^{-6} \cdot \text{m}^3 \cdot \text{mol}^{-1}$.

Table S2 Apparent specific volume (v_ϕ) and taste quality of L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate from $T/K = 288.15$ to 323.15 and $P = (101.3 \text{ kPa})$.

$m_B/\text{mol}\cdot\text{kg}^{-1}$	$v_\phi/\text{cm}^3\cdot\text{g}^{-1}$							
	$T/K = 288.15$	293.15	298.15	303.15	308.15	313.15	318.15	323.15
L-Aspartic acid in aqueous solution of Di-sodium tartrate								
0.00	0.54	0.54	0.54	0.55	0.55	0.55	0.55	0.55
0.10	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.57
0.25	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58
0.50	0.58	0.58	0.58	0.58	0.58	0.58	0.59	0.59
0.75	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
L-Aspartic acid in aqueous solution of Tri-sodium citrate								
0.10	0.57	0.58	0.58	0.58	0.58	0.58	0.58	0.58
0.25	0.58	0.58	0.58	0.58	0.58	0.59	0.59	0.59
0.50	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
0.75	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
L-Glutamic acid in aqueous solution of Di-sodium tartrate								
0.00	0.60	0.60	0.61	0.61	0.62	0.62	0.62	0.62
0.10	0.61	0.62	0.62	0.62	0.62	0.62	0.62	0.63
0.25	0.62	0.62	0.62	0.62	0.62	0.63	0.63	0.63
0.50	0.62	0.62	0.63	0.63	0.63	0.63	0.63	0.64
0.75	0.62	0.63	0.63	0.63	0.63	0.64	0.64	0.64
L-Glutamic acid in aqueous solution of Tri-sodium citrate								

0.10	0.62	0.63	0.63	0.63	0.63	0.63	0.63	0.63
0.25	0.63	0.63	0.63	0.63	0.63	0.64	0.64	0.64
0.50	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.64
0.75	0.64	0.64	0.64	0.64	0.64	0.65	0.65	0.65

Standard uncertainties are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4}$ mol·kg⁻¹.

Table S3 Hydration number (N_h) values of L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate, $P = (101.3$ kPa).

$m_B/\text{mol} \cdot \text{kg}^{-1}$	N_h		
	$T/\text{K} = 288.15$	$T/\text{K} = 298.15$	$T/\text{K} = 308.15$
L-Aspartic acid in aqueous solution of Di-sodium tartrate			
0.00	6.24	5.30	4.27
0.10	5.09	4.36	3.56
0.25	4.76	4.05	3.29
0.50	4.33	3.71	3.02
0.75	3.92	3.37	2.73
L-Aspartic acid in aqueous solution of Tri-sodium citrate			
0.10	4.59	3.91	3.20
0.25	4.36	3.70	3.01
0.50	3.99	3.37	2.75
0.75	3.66	3.09	2.51
L-Glutamic acid in aqueous solution of Di-sodium tartrate			
0.00	5.31	4.25	3.27
0.10	4.61	3.83	3.07
0.25	4.33	3.68	2.95
0.50	4.19	3.45	2.75
0.75	4.13	3.40	2.67
L-Glutamic acid in aqueous solution of Tri-sodium citrate			
0.10	4.10	3.51	2.84
0.25	3.95	3.28	2.61
0.50	3.64	3.03	2.39
0.75	3.32	2.75	2.22

Standard uncertainties are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4}$ mol·kg⁻¹.

Table S4 Partial Molar Expansion, $(\partial V_{2,\phi}^{\circ}/\partial T)_P$, and Second–Order Derivatives $(\partial^2 V_{2,\phi}^{\circ}/\partial T^2)_P$ of L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate from $T/K = 288.15$ to 323.15 and $P = (101.3 \text{ kPa})$.

m_B	$10^6 \cdot (\partial V_{2,\phi}^{\circ}/\partial T) / \text{m}^3 \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$								$10^6 \cdot (\partial^2 V_{2,\phi}^{\circ}/\partial T^2)_P$	
$\text{mol} \cdot \text{kg}^{-1}$	$T/K = 288.15$	293.15	298.15	303.15	308.15	313.15	318.15	323.15	SD	$\text{m}^3 \cdot \text{mol}^{-1} \cdot \text{K}^{-2}$
L-Aspartic acid in aqueous solution of Di-sodium tartrate										
0.0	0.055	0.053	0.051	0.049	0.047	0.045	0.043	0.041	0.040	-0.0004
0.1	0.036	0.031	0.026	0.021	0.016	0.014	0.006	0.001	0.042	-0.0010
0.25	0.039	0.035	0.030	0.026	0.022	0.018	0.014	0.010	0.039	-0.0008
0.50	0.036	0.028	0.024	0.021	0.018	0.015	0.012	0.009	0.040	-0.0006
0.75	0.025	0.024	0.022	0.020	0.019	0.018	0.017	0.015	0.028	-0.0003
L-Aspartic acid in aqueous solution of Tri-sodium citrate										
0.1	0.035	0.031	0.027	0.022	0.018	0.014	0.009	0.005	0.045	-0.0009
0.25	0.036	0.033	0.031	0.029	0.026	0.024	0.022	0.019	0.043	-0.0005
0.50	0.042	0.037	0.031	0.026	0.020	0.015	0.009	0.004	0.045	-0.0011
0.75	0.040	0.034	0.028	0.021	0.016	0.009	0.003	-0.003	0.045	-0.0012
L-Glutamic acid in aqueous solution of Di-sodium tartrate										
0.0	0.137	0.127	0.118	0.108	0.099	0.089	0.080	0.070	0.122	-0.0019
0.1	0.070	0.064	0.057	0.050	0.044	0.037	0.031	0.024	0.063	-0.0013
0.25	0.040	0.040	0.040	0.039	0.031	0.039	0.039	0.039	0.027	-0.0001
0.50	0.069	0.065	0.062	0.058	0.054	0.050	0.046	0.042	0.097	-0.0008
0.75	0.076	0.073	0.070	0.067	0.064	0.061	0.058	0.055	0.087	-0.0006
L-Glutamic acid in aqueous solution of Tri-sodium citrate										

0.1	0.023	0.024	0.025	0.027	0.028	0.029	0.030	0.032	0.047	0.0002
0.25	0.065	0.059	0.052	0.046	0.039	0.033	0.026	0.020	0.070	-0.0013
0.50	0.046	0.045	0.044	0.043	0.042	0.041	0.040	0.040	0.134	-0.0002
0.75	0.047	0.045	0.043	0.041	0.040	0.038	0.036	0.034	0.077	-0.0003

SD is the standard deviation. Standard uncertainties are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4}$ mol·kg⁻¹.

Table S5 Pair, V_{AB} , and Triplet, V_{ABB} , Interaction Coefficients of L-Aspartic acid and L-Glutamic acid in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate from $T/K = 288.15$ to 323.15 and $P = (101.3$ kPa).

T/K	$10^6 \cdot V_{AB} / \text{m}^3 \cdot \text{mol}^{-2} \cdot \text{kg}$	$10^6 \cdot V_{ABB} / \text{m}^3 \cdot \text{mol}^{-3} \cdot \text{kg}^2$	$10^6 \cdot V_{AB} / \text{m}^3 \cdot \text{mol}^{-2} \cdot \text{kg}$	$10^6 \cdot V_{ABB} / \text{m}^3 \cdot \text{mol}^{-3} \cdot \text{kg}^2$
L-Aspartic acid in aqueous solution of Di-sodium tartrate			L-Aspartic acid in aqueous solution of Tri-sodium citrate	
288.15	10.55±2.43	-5.58±2.47	13.91±3.88	-8.21±3.94
293.15	10.20±2.30	-5.39±2.34	13.67±3.78	-8.06±3.83
298.15	9.96±2.20	-5.26±2.23	13.37±3.69	-7.84±3.74
303.15	9.63±2.12	-5.01±2.15	13.12±3.53	-7.66±3.58
308.15	9.34±2.04	-4.82±2.07	12.72±3.40	-7.39±3.45
313.15	8.90±1.88	-4.53±1.90	12.57±3.27	-7.37±3.27
318.15	8.44±1.65	-4.17±1.67	12.19±3.10	-7.15±3.14
323.15	8.07±1.53	-3.93±1.56	11.76±2.95	-6.85±2.99
L-Glutamic acid in aqueous solution of Di-sodium tartrate			L-Glutamic acid in aqueous solution of Tri-sodium citrate	
288.15	7.04±1.41	-4.38±1.43	9.96±2.88	-5.67±2.92
293.15	6.38±1.24	-3.84±1.26	9.26±2.62	-5.20±2.65

298.15	4.91±0.82	-2.75±0.83	7.74±1.83	-4.09±1.86
303.15	4.35±0.73	-2.31±0.74	7.22±1.67	-3.74±1.69
308.15	3.23±0.34	-1.45±0.34	6.29±1.03	-3.18±1.04
313.15	2.45±0.25	-0.76±0.25	5.27±0.67	-2.39±0.68
318.15	2.11±0.26	-0.49±0.26	4.88±0.49	-2.11±0.49
323.15	1.39±0.42	0.016±0.43	4.22±0.32	-1.63±0.32

Standard uncertainties are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4}$ mol·kg⁻¹

Table S6 The Apparent molar isentropic compression, $K_{S,2,\phi}$ of L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate at $T/K = 288.15$ to 323.15 K and $P = (101.3$ kPa).

$m_A/\text{mol}\cdot\text{kg}^{-1}$	$10^{14} \cdot K_{S,2,\phi} / \text{m}^3 \cdot \text{mol}^{-1} \cdot \text{Pa}^{-1}$							
	288.15K	293.15K	298.15K	303.15K	308.15 K	313.15K	318.15K	323.15K
L- Aspartic acid in water								
0.00517	-7.45	-7.01	-6.55	-6.16	-5.50	-4.44	-4.04	-3.57
0.00712	-7.44	-6.96	-6.52	-6.14	-5.46	-4.41	-3.96	-3.54
0.00921	-7.42	-6.94	-6.48	-6.09	-5.41	-4.39	-3.93	-3.51
0.01109	-7.39	-6.90	-6.45	-6.06	-5.39	-4.37	-3.90	-3.48
0.01300	-7.37	-6.89	-6.42	-6.03	-5.35	-4.34	-3.88	-3.46
0.01506	-7.34	-6.83	-6.38	-5.98	-5.30	-4.31	-3.85	-3.44
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.1$ mol·kg⁻¹								
0.00502	-5.36	-5.26	-5.15	-5.05	-4.72	-3.82	-3.78	-3.47
0.00741	-5.34	-5.23	-5.13	-5.03	-4.69	-3.78	-3.76	-3.44
0.01180	-5.32	-5.20	-5.11	-5.01	-4.66	-3.76	-3.73	-3.42

0.01306	-5.29	-5.19	-5.07	-5.00	-4.65	-3.74	-3.71	-3.39
0.01732	-5.27	-5.16	-5.06	-4.97	-4.63	-3.71	-3.69	-3.37
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.00584	-5.02	-4.89	-4.76	-4.58	-4.10	-3.16	-2.88	-2.56
0.00817	-5.00	-4.86	-4.74	-4.56	-4.06	-3.12	-2.86	-2.52
0.01106	-4.97	-4.84	-4.70	-4.55	-4.03	-3.11	-2.82	-2.50
0.01337	-4.94	-4.82	-4.68	-4.52	-4.00	-3.08	-2.79	-2.46
0.01555	-4.92	-4.81	-4.66	-4.50	-3.97	-3.05	-2.77	-2.44
0.01667	-4.90	-4.79	-4.64	-4.48	-3.95	-3.02	-2.74	-2.41
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.00638	-4.34	-4.20	-3.99	-3.74	-3.18	-2.44	-2.50	-2.13
0.00782	-4.32	-4.19	-3.97	-3.71	-3.16	-2.41	-2.48	-2.12
0.00982	-4.31	-4.15	-3.94	-3.68	-3.14	-2.37	-2.46	-2.09
0.01307	-4.29	-4.14	-3.92	-3.64	-3.12	-2.34	-2.44	-2.07
0.01509	-4.26	-4.11	-3.91	-3.62	-3.11	-2.32	-2.42	-2.05
0.01639	-4.25	-4.09	-3.87	-3.60	-3.08	-2.31	-2.40	-2.03
L-Aspartic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.00547	-4.05	-3.85	-3.57	-3.30	-2.97	-2.12	-2.34	-2.12
0.00739	-4.03	-3.83	-3.55	-3.27	-2.95	-2.10	-2.32	-2.10
0.01025	-4.00	-3.81	-3.52	-3.25	-2.93	-2.07	-2.28	-2.07
0.01347	-3.97	-3.79	-3.51	-3.22	-2.90	-2.03	-2.25	-2.05
0.01664	-3.95	-3.76	-3.48	-3.19	-2.88	-2.00	-2.23	-2.02

L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.00576	-4.61	-4.45	-4.32	-4.22	-3.85	-2.94	-2.71	-2.43
0.00754	-4.60	-4.43	-4.30	-4.19	-3.83	-2.91	-2.69	-2.41
0.01002	-4.58	-4.42	-4.28	-4.16	-3.80	-2.89	-2.65	-2.40
0.01189	-4.56	-4.39	-4.26	-4.13	-3.79	-2.87	-2.63	-2.37
0.01520	-4.53	-4.38	-4.24	-4.10	-3.76	-2.85	-2.61	-2.36
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.25 \text{ mol}\cdot\text{kg}^{-1}$								
0.00624	-4.16	-3.85	-3.51	-3.25	-2.84	-1.96	-1.74	-1.49
0.00784	-4.13	-3.82	-3.49	-3.23	-2.81	-1.94	-1.70	-1.47
0.01080	-4.12	-3.80	-3.46	-3.21	-2.79	-1.92	-1.68	-1.46
0.01208	-4.09	-3.78	-3.44	-3.19	-2.78	-1.89	-1.65	-1.44
0.01490	-4.07	-3.77	-3.42	-3.18	-2.76	-1.87	-1.64	-1.42
0.01825	-4.06	-3.75	-3.40	-3.15	-2.73	-1.85	-1.61	-1.39
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.00597	-3.55	-3.21	-3.02	-2.80	-2.30	-1.53	-1.35	-1.03
0.00809	-3.54	-3.19	-3.01	-2.79	-2.28	-1.52	-1.33	-1.03
0.00985	-3.52	-3.17	-3.01	-2.77	-2.25	-1.50	-1.32	-1.03
0.01284	-3.49	-3.15	-3.01	-2.74	-2.21	-1.49	-1.30	-1.03
0.01520	-3.47	-3.12	-3.01	-2.73	-2.20	-1.47	-1.29	-1.02
0.01581	-3.45	-3.10	-2.97	-2.69	-2.15	-1.43	-1.25	-1.02
L-Aspartic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.00626	-3.25	-2.95	-2.68	-2.45	-1.95	-1.10	-0.88	-0.83

0.00788	-3.24	-2.94	-2.66	-2.43	-1.93	-1.09	-0.87	-0.83
0.01082	-3.22	-2.91	-2.63	-2.42	-1.90	-1.09	-0.87	-0.83
0.01180	-3.20	-2.90	-2.62	-2.40	-1.87	-1.09	-0.87	-0.82
0.01461	-3.17	-2.87	-2.59	-2.38	-1.86	-1.09	-0.87	-0.82
0.01732	-3.15	-2.85	-2.58	-2.36	-1.84	-1.09	-0.86	-0.82
L-Glutamic acid in water ($10^{16} \cdot K_{S,2,\phi} / \text{m}^3 \cdot \text{mol}^{-1} \cdot \text{Pa}^{-1}$)								
0.01104	-3.80	-3.45	-3.12	-2.70	-2.39	-2.11	-2.01	-1.83
0.01308	-3.78	-3.42	-3.09	-2.68	-2.36	-2.08	-1.98	-1.81
0.01522	-3.75	-3.40	-3.07	-2.63	-2.33	-2.06	-1.95	-1.77
0.02078	-3.72	-3.38	-3.04	-2.62	-2.30	-2.04	-1.92	-1.73
0.02517	-3.71	-3.35	-3.02	-2.60	-2.28	-2.00	-1.89	-1.70
0.03030	-3.68	-3.33	-2.99	-2.58	-2.24	-1.97	-1.88	-1.66
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.1 \text{ mol} \cdot \text{kg}^{-1}$								
0.01288	-2.54	-2.39	-2.25	-2.10	-1.98	-1.80	-1.75	-1.65
0.01523	-2.51	-2.36	-2.22	-2.08	-1.96	-1.77	-1.72	-1.62
0.01930	-2.48	-2.34	-2.19	-2.06	-1.92	-1.76	-1.69	-1.60
0.02496	-2.46	-2.32	-2.18	-2.03	-1.90	-1.73	-1.66	-1.57
0.03127	-2.45	-2.30	-2.15	-2.01	-1.88	-1.70	-1.65	-1.55
0.03591	-2.42	-2.27	-2.14	-1.98	-1.85	-1.68	-1.63	-1.51
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.25 \text{ mol} \cdot \text{kg}^{-1}$								
0.01410	-2.38	-2.30	-2.06	-1.97	-1.87	-1.71	-1.65	-1.53
0.01930	-2.36	-2.27	-2.04	-1.95	-1.86	-1.68	-1.62	-1.52

0.02391	-2.34	-2.24	-2.00	-1.93	-1.82	-1.66	-1.61	-1.49
0.03000	-2.32	-2.23	-1.98	-1.90	-1.81	-1.60	-1.58	-1.46
0.03535	-2.29	-2.21	-1.96	-1.89	-1.78	-1.58	-1.54	-1.44
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.50 \text{ mol}\cdot\text{kg}^{-1}$								
0.01228	-2.30	-2.18	-2.03	-1.89	-1.71	-1.58	-1.54	-1.41
0.01354	-2.28	-2.17	-2.01	-1.87	-1.69	-1.56	-1.51	-1.39
0.01654	-2.24	-2.14	-1.98	-1.82	-1.67	-1.54	-1.47	-1.38
0.02018	-2.23	-2.12	-1.96	-1.80	-1.64	-1.50	-1.45	-1.35
0.02585	-2.20	-2.09	-1.93	-1.78	-1.61	-1.48	-1.42	-1.31
0.03703	-2.18	-2.06	-1.90	-1.75	-1.59	-1.44	-1.41	-1.28
L-Glutamic acid in aqueous solution of Di-sodium tartrate at $m_B = 0.75 \text{ mol}\cdot\text{kg}^{-1}$								
0.01159	-2.22	-2.09	-1.93	-1.81	-1.67	-1.50	-1.41	-1.33
0.01375	-2.19	-2.06	-1.91	-1.79	-1.64	-1.47	-1.39	-1.30
0.01765	-2.16	-2.05	-1.89	-1.76	-1.62	-1.43	-1.37	-1.28
0.01995	-2.14	-2.02	-1.87	-1.73	-1.59	-1.41	-1.33	-1.26
0.02676	-2.12	-1.99	-1.84	-1.72	-1.57	-1.38	-1.32	-1.22
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.1 \text{ mol}\cdot\text{kg}^{-1}$								
0.01247	-2.13	-2.00	-1.90	-1.71	-1.64	-1.43	-1.40	-1.27
0.01463	-2.11	-1.97	-1.86	-1.68	-1.62	-1.40	-1.37	-1.24
0.01634	-2.08	-1.95	-1.83	-1.66	-1.59	-1.38	-1.35	-1.21
0.02218	-2.06	-1.93	-1.82	-1.63	-1.58	-1.36	-1.32	-1.18
0.02857	-2.02	-1.92	-1.79	-1.62	-1.54	-1.34	-1.30	-1.16

0.03390	-2.01	-1.89	-1.77	-1.57	-1.52	-1.32	-1.26	-1.13
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.25 \text{ mol} \cdot \text{kg}^{-1}$								
0.01213	-1.99	-1.85	-1.72	-1.56	-1.45	-1.25	-1.21	-1.11
0.01438	-1.97	-1.80	-1.69	-1.53	-1.42	-1.21	-1.18	-1.09
0.01771	-1.95	-1.77	-1.67	-1.50	-1.39	-1.18	-1.15	-1.06
0.02308	-1.91	-1.75	-1.65	-1.48	-1.38	-1.17	-1.12	-1.05
0.02531	-1.89	-1.73	-1.64	-1.44	-1.35	-1.13	-1.09	-1.03
0.03401	-1.87	-1.70	-1.61	-1.42	-1.34	-1.10	-1.07	-1.01
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.50 \text{ mol} \cdot \text{kg}^{-1}$								
0.01104	-1.86	-1.71	-1.55	-1.40	-1.31	-1.10	-1.07	-1.02
0.01239	-1.83	-1.69	-1.51	-1.38	-1.28	-1.06	-1.05	-1.02
0.01547	-1.81	-1.66	-1.49	-1.35	-1.26	-1.04	-1.05	-1.02
0.02012	-1.79	-1.64	-1.47	-1.32	-1.24	-1.04	-1.04	-1.01
0.02521	-1.78	-1.61	-1.44	-1.30	-1.22	-1.03	-1.04	-1.01
0.03006	-1.75	-1.59	-1.42	-1.27	-1.20	-1.02	-1.03	-1.00
L-Glutamic acid in aqueous solution of Tri-sodium citrate at $m_B = 0.75 \text{ mol} \cdot \text{kg}^{-1}$								
0.01088	-1.71	-1.60	-1.43	-1.30	-1.18	-1.02	-1.00	-1.00
0.01408	-1.69	-1.58	-1.39	-1.29	-1.17	-1.02	-1.00	-1.00
0.01532	-1.66	-1.56	-1.37	-1.27	-1.13	-1.02	-1.00	-0.99
0.02000	-1.63	-1.52	-1.34	-1.23	-1.12	-1.02	-1.00	-0.99
0.02799	-1.62	-1.50	-1.30	-1.21	-1.10	-1.01	-1.00	-0.99
0.03107	-1.58	-1.48	-1.28	-1.19	-1.07	-1.01	-1.00	-0.99

m_A is the molality of solute in water or water+DST/TSC. m_B is the molality of DST/TSC in water. Standard uncertainties u are $u(T) = 0.03$ K, $u(P) = 0.5$ kPa, $u(m) = 2.8 \cdot 10^{-4}$ mol·kg⁻¹, $u(K_{S, 2, \phi}) = 0.30$ to $1.25 \cdot 10^{-15}$ m³·mol⁻¹·Pa⁻¹.

Table S7 Viscosity B -coefficients, $B/V_{2, \phi}^0$ and dB/dT for L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate and at $T/K = 288.15$ to 318.15 and $P = (101.3$ kPa).

m_B	B	$B/V_{2,\phi}^0$	B	$B/V_{2,\phi}^0$	B	$B/V_{2,\phi}^0$	B	$B/V_{2,\phi}^0$	dB/dT
mol.kg ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹	cm ³ ·mol ⁻¹ ·K ⁻¹
$T/K = 288.15$			$T/K = 298.15$		$T/K = 308.15$		$T/K = 318.15$		
L-Aspartic acid in aqueous solution of Di-sodium tartrate									
0.00	0.127	1.77	0.130	1.80	0.133	1.82	0.134	1.83	0.0002
			0.130 ^a						
0.10	0.130	1.73	0.132	1.75	0.134	1.78	0.134	1.77	0.0001
0.25	0.132	1.73	0.134	1.75	0.135	1.77	0.136	1.77	0.0001
0.50	0.134	1.73	0.137	1.76	0.138	1.77	0.139	1.78	0.0001
0.75	0.137	1.74	0.139	1.77	0.140	1.77	0.141	1.78	0.0001
L-Aspartic acid in aqueous solution of Tri-sodium citrate									
0.10	0.130	1.70	0.133	1.72	0.134	1.74	0.135	1.75	0.0002
0.25	0.133	1.72	0.135	1.74	0.137	1.76	0.138	1.76	0.0002
0.50	0.137	1.75	0.139	1.77	0.141	1.78	0.142	1.79	0.0002
0.75	0.140	1.76	0.142	1.78	0.143	1.79	0.144	1.80	0.0001
L-Glutamic acid in aqueous solution of Di-sodium tartrate									
0.00	0.283	3.20	0.291	3.23	0.296	3.27	0.299	3.27	0.0006

			0.290 ^a						
0.10	0.285	3.16	0.292	3.20	0.297	3.25	0.299	3.26	0.0005
0.25	0.287	3.15	0.294	3.21	0.299	3.26	0.301	3.27	0.0005
0.50	0.289	3.15	0.296	3.20	0.301	3.24	0.303	3.25	0.0005
0.75	0.293	3.18	0.299	3.23	0.303	3.25	0.305	3.25	0.0004
L-Glutamic acid in aqueous solution of Tri-sodium citrate									
0.10	0.286	3.12	0.293	3.18	0.298	3.23	0.300	3.24	0.0005
0.25	0.288	3.12	0.295	3.18	0.300	3.22	0.302	3.23	0.0005
0.50	0.291	3.13	0.299	3.19	0.303	3.22	0.305	3.23	0.0005
0.75	0.294	3.13	0.301	3.18	0.305	3.22	0.307	3.22	0.0004

^a Ref 14. Standard deviations for fitting in equation lie in the range of $(0.005 \text{ to } 0.500) \cdot 10^{-3} \cdot \text{m}^3 \cdot \text{mol}^{-1}$ and the standard deviation in dB/dT lie in the range of $(0.0025\text{-}0.0300) \text{ m}^3 \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$. Standard uncertainties are $u(T) = 0.03 \text{ K}$, $u(P) = 0.5 \text{ kPa}$, $u(m) = 2.8 \cdot 10^{-4} \text{ mol} \cdot \text{kg}^{-1}$.

Table S8 Standard molar enthalpies of dilution $\Delta_{\text{dil}}H^0$ for L-Aspartic acid and L-Glutamic acid in water and in aqueous solutions of Di-sodium tartrate and Tri-sodium citrate at $T/\text{K} = 298.15$ and $P = (101.3 \text{ kPa})$.

$m_B/\text{mmol} \cdot \text{kg}^{-1}$	$\Delta_{\text{dil}}H^0/\text{J} \cdot \text{mol}^{-1}$			
	ASP in aqueous solutions of DST	ASP in aqueous solutions of TSC	GLU in aqueous solutions of DST	GLU in aqueous solutions of TSC
0	3484.44	-	452.20	-
100	-1342.05	2939.28	-1616.09	1038.89
250	1422.76	3622.41	-876.67	3254.98
500	1586.44	5937.94	331.93	4344.09

Standard uncertainties, u are $u(T) = 0.03 \text{ K}$, $u(p) = 0.5 \text{ kPa}$, $u(m) = 2.8 \cdot 10^{-4} \text{ mol} \cdot \text{kg}^{-1}$, $u(\Delta_{\text{dil}}H^0) = 0.5 \text{ kJ} \cdot \text{mol}^{-1}$.

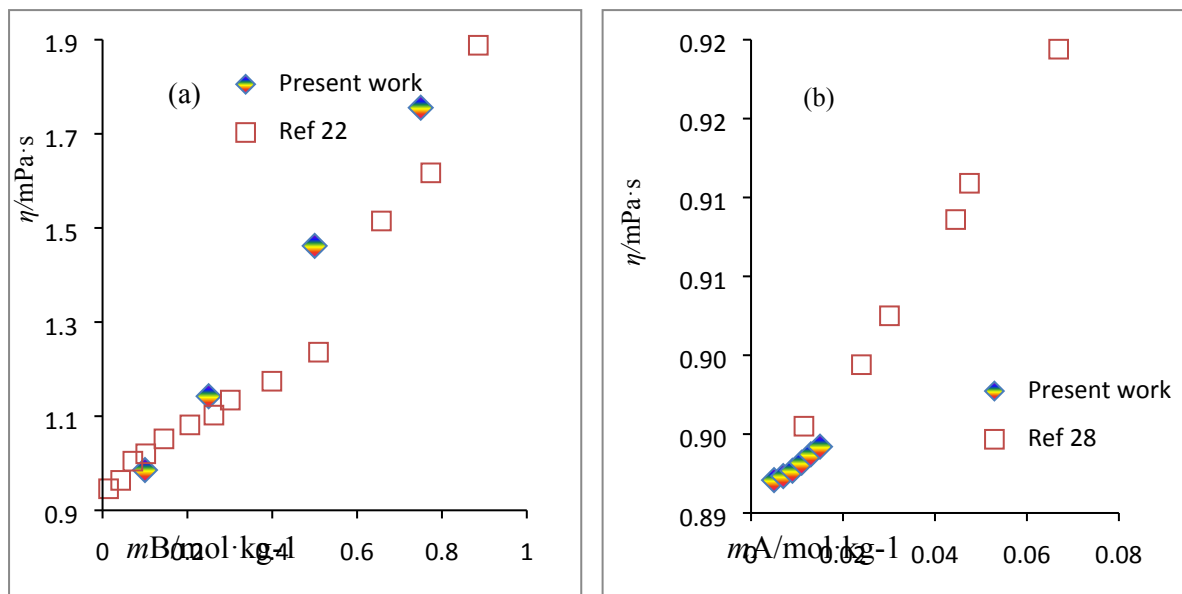


Fig. S1. Plots of viscosity, η versus molality for aqueous solutions of (a) TSC and (b) GLU at 298.15 K and comparison with the literature values.

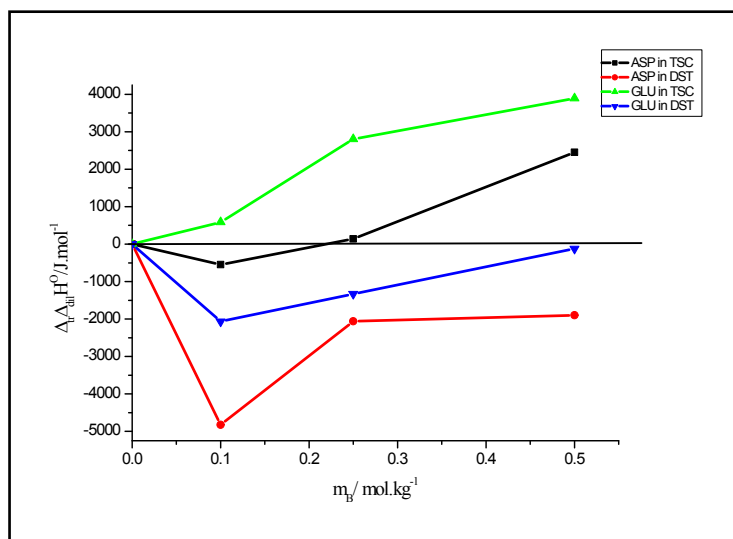


Fig. S2. Standard molar enthalpy of transfer of L-Aspartic acid/L-Glutamic acid ($\Delta_{\text{tr}}\Delta_{\text{dil}}H^0$) versus molalities, m_B of aqueous solutions of DST/TSC at $T/\text{K} = 298.15$.

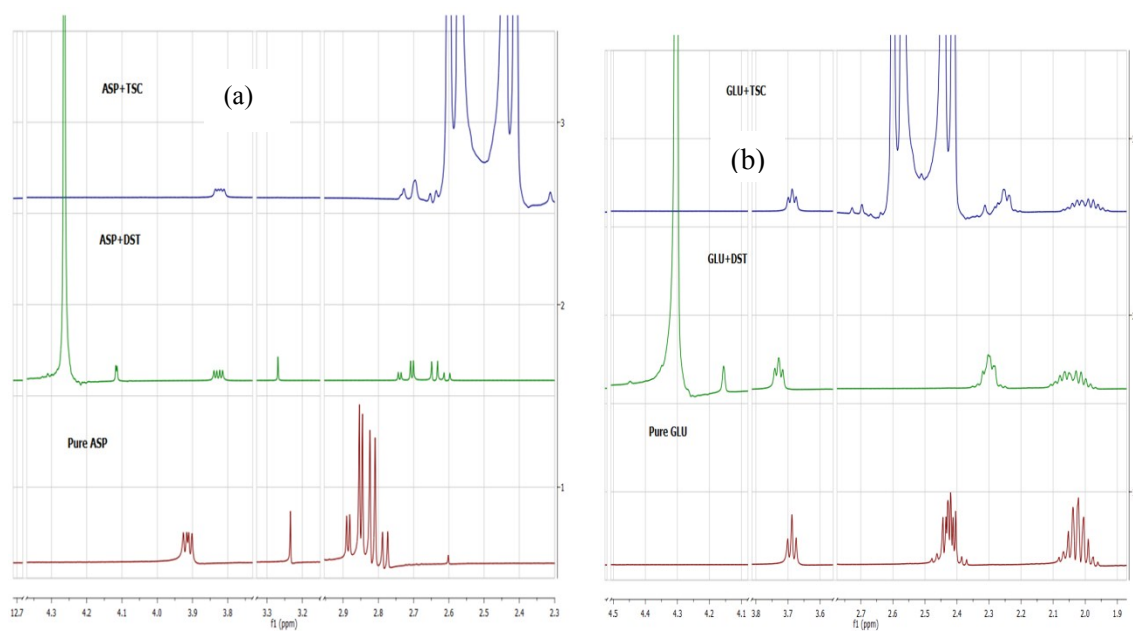


Fig. S3. ^1H NMR Spectra of (a) ASP, (b) GLU in pure water as well as in the presence of DST and TSC.