ELECTRONIC SUPPLEMENTARY INFORMATION

Recovery of tyrosol from aqueous streams using hydrophobic ionic liquids: A first step towards developing sustainable processes for olive mill wastewater (OMW) management

Marcos Larriba, Salama Omar, Pablo Navarro, Julián García, Francisco Rodríguez, Maria Gonzalez-Miquel

Table S1 Experimental extraction efficiencies (*E*) in the extraction of tyrosol from water as a function of temperature (*T*), solvent to feed ratio (*S/F*) and the addition of sodium salts using the $[P_{4441}][Tf_2N]$ as extraction solvent.

T / K	*S/F* (in vol.)	Salt Added	*E* / %
303.2	1.0	-	43.2 ± 0.9
	2.5	-	62.7 ± 1.2
	5.0	-	76.9 ± 1.5
	1.0	NaCl (5 % wt.)	48.8 ± 1.5
	2.5	NaCl (5 % wt.)	67.8 ± 1.9
	5.0	NaCl (5 % wt.)	80.2 ± 2.3
	1.0	NaCl (10 % wt.)	58.2 ± 1.7
	2.5	NaCl (10 % wt.)	76.9 ± 2.3
	5.0	NaCl (10 % wt.)	88.8 ± 2.6
	1.0	NaCl (20 % wt.)	74.2 ± 2.0
	2.5	NaCl (20 % wt.)	87.2 ± 2.5
	5.0	NaCl (20 % wt.)	94.3 ± 2.8
	1.0	NaAcetate (10 % wt.)	45.9 ± 1.3
	1.0	NaThiosulfate (10 % wt.)	39.8 ± 1.1
313.2	1.0	-	43.6 ± 0.8
	2.5	-	63.7 ± 1.3
	5.0	-	77.8 ± 1.4
323.2	1.0	-	43.8 ± 0.8
	2.5	-	64.3 ± 1.4
	5.0	-	78.8 ± 1.6

Table S2 Experimental extraction efficiencies (*E*) in the extraction of tyrosol from water as a function of temperature (*T*), solvent to feed ratio (*S/F*) and the addition of sodium salts using the $[N_{4441}][Tf_2N]$ as extraction solvent.

T / K	*S/F* (in vol.)	Salt Added	*E* / %
303.2	1.0	-	44.6 ± 0.8
	2.5	-	63.3 ± 1.2
	5.0	-	72.8 ± 1.5
	1.0	NaCl (5 % wt.)	46.9 ± 1.4
	2.5	NaCl (5 % wt.)	68.5 ± 2.0
	5.0	NaCl (5 % wt.)	77.5 ± 2.3
	1.0	NaCl (10 % wt.)	56.8 ± 1.7
	2.5	NaCl (10 % wt.)	74.7 ± 2.2
	5.0	NaCl (10 % wt.)	84.6 ± 2.4
	1.0	NaCl (20 % wt.)	74.7 ± 2.2
	2.5	NaCl (20 % wt.)	87.0 ± 2.6
	5.0	NaCl (20 % wt.)	93.3 ± 2.7
	1.0	NaAcetate (10 % wt.)	48.7 ± 1.5
	1.0	NaThiosulfate (10 % wt.)	43.2 ± 1.2
313.2	1.0	-	44.7 ± 0.9
	2.5	-	64.1 ± 1.3
	5.0	-	74.4 ± 1.3
323.2	1.0	-	45.5 ± 0.8
	2.5	-	64.9 ± 1.3
	5.0	-	77.6 ± 1.5

Table S3 Experimental extraction efficiencies (*E*) in the extraction of tyrosol from water as a function of temperature (*T*), solvent to feed ratio (*S/F*) and the addition of sodium salts using the $[N_{8881}][Tf_2N]$ as extraction solvent.

T / K	*S/F* (in vol.)	Salt Added	*E* / %
303.2	1.0	-	24.0 ± 0.4
	2.5	-	37.1 ± 0.7
	5.0	-	46.5 ± 0.9
	1.0	NaCl (5 % wt.)	28.3 ± 0.8
	2.5	NaCl (5 % wt.)	48.5 ± 1.5
	5.0	NaCl (5 % wt.)	59.7 ± 1.8
	1.0	NaCl (10 % wt.)	39.3 ± 1.1
	2.5	NaCl (10 % wt.)	57.7 ± 1.7
	5.0	NaCl (10 % wt.)	67.6 ± 2.0
	1.0	NaCl (20 % wt.)	54.9 ± 1.7
	2.5	NaCl (20 % wt.)	65.1 ± 1.8
	5.0	NaCl (20 % wt.)	73.1 ± 2.0
	1.0	NaAcetate (10 % wt.)	33.7 ± 1.0
	1.0	NaThiosulfate (10 % wt.)	20.9 ± 0.5
313.2	1.0	-	23.5 ± 0.3
	2.5	-	38.7 ± 0.7
	5.0	-	50.3 ± 1.0
323.2	1.0	-	24.8 ± 0.5
	2.5	-	40.0 ± 0.7
	5.0	-	53.9 ± 0.9

Table S4 Densities (ρ) and dynamic viscosities (η) of $[P_{4441}][Tf_2N]$, $[N_{4441}][Tf_2N]$, and $[N_{8881}][Tf_2N]$ ILs as a function of temperature at P = 0.1 MPa.[a]

T/ K	ρ/ g.cm^{-3}		
	$[P_{4441}][Tf_2N]$	$[N_{4441}][Tf_2N]$	$[N_{8881}][Tf_2N]$
288.15	1.26251	1.26940	1.11460
293.15	1.25834	1.26518	1.11088
298.15	1.25417	1.26093	1.10706
303.15	1.24999	1.25667	1.10333
308.15	1.24580	1.25262	1.09962
313.15	1.24163	1.24845	1.09590
318.15	1.23747	1.24428	1.09219
323.15	1.23332	1.24011	1.08847
328.15	1.22918	1.23595	1.08475
333.15	1.22511	1.23185	1.08108
	η/ mPa.s		
	$[P_{4441}][Tf_2N]$	$[N_{4441}][Tf_2N]$	$[N_{8881}][Tf_2N]$
288.15	403.8	1058.0	1084.0
293.15	288.7	748.8	786.7
298.15	210.8	505.8	540.8
303.15	157.4	350.2	396.4
308.15	119.3	249.1	296.0
313.15	92.08	180.6	223.6
318.15	71.75	134.6	170.6
323.15	56.41	101.7	132.2
328.15	45.47	77.74	103.4
333.15	37.94	58.72	82.29

[a] Standard uncertainties u are $u(T)$ = 0.01 K, $u(P)$ = 1 kPa, $u(\rho)$ = 0.00008 g·cm^{-3}, $u(\eta)$ = 0.9 %.