

## **Ionic liquids-ultrasound based efficient extraction of flavonoid glycosides and triterpenoid saponins from licorice**

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Dongzhi Yang <sup>1,2</sup>, Daoquan Tang <sup>1,2,\*</sup>

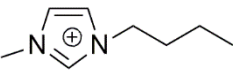
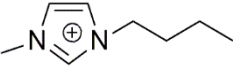
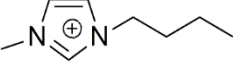
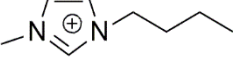
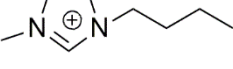
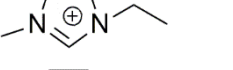
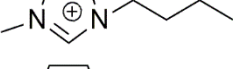
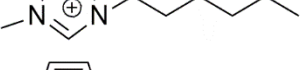
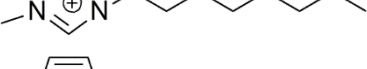
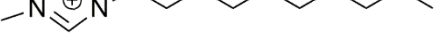
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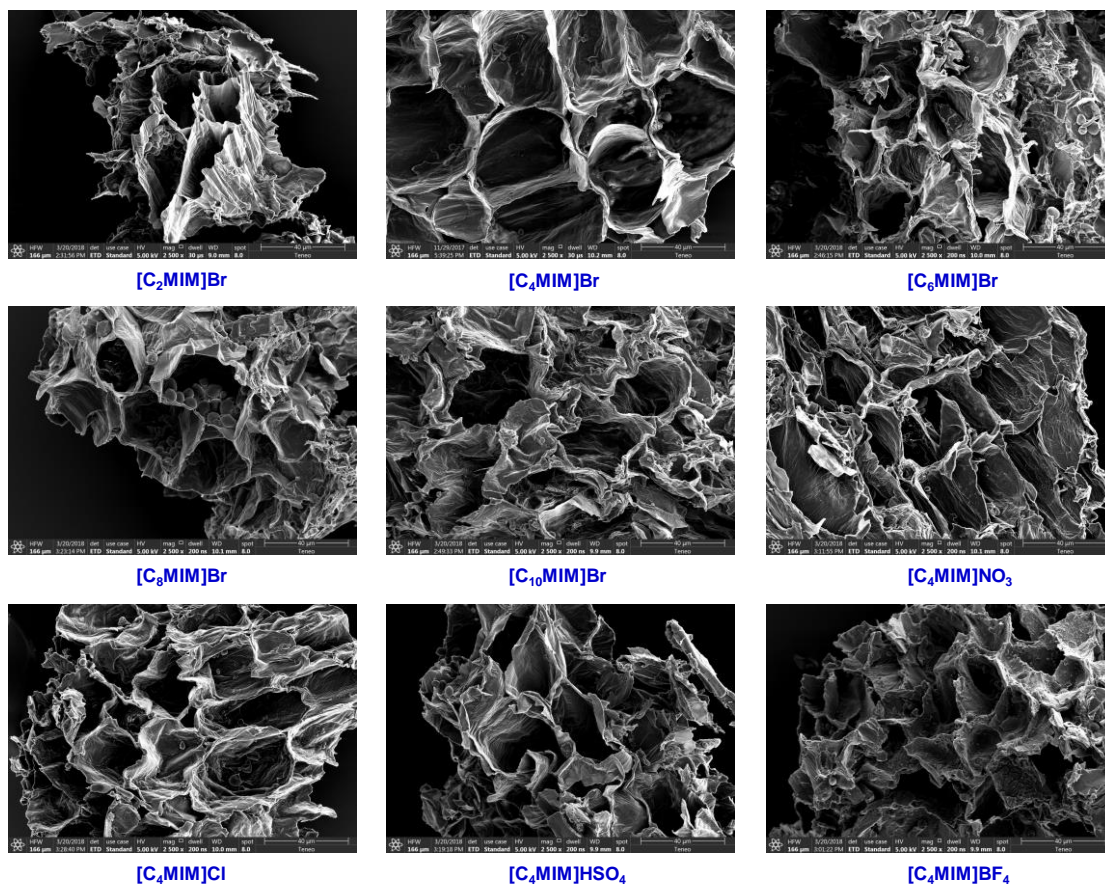
**Table S1.** Names and structures of ionic liquids used in this study.

Names	Abbreviations	Cations	Anions
1-butyl-3-methylimidazolium acetate	[C <sub>4</sub> MIM]Ac		Ac <sup>-</sup>
1-butyl-3-methylimidazolium chloride	[C <sub>4</sub> MIM]Cl		Cl <sup>-</sup>
1-butyl-3-methylimidazolium tetrafluoroborate	[C <sub>4</sub> MIM]BF <sub>4</sub>		BF <sub>4</sub> <sup>-</sup>
1-butyl-3-methylimidazolium nitrate	[C <sub>4</sub> MIM]NO <sub>3</sub>		NO <sub>3</sub> <sup>-</sup>
1-butyl-3-methylimidazolium hydrogen sulfate	[C <sub>4</sub> MIM]HSO <sub>4</sub>		HSO <sub>4</sub> <sup>-</sup>
1-ethyl-3-methylimidazolium bromide	[C <sub>2</sub> MIM]Br		Br <sup>-</sup>
1-butyl-3-methylimidazolium bromide	[C <sub>4</sub> MIM]Br		Br <sup>-</sup>
1-hexyl-3-methylimidazolium bromide	[C <sub>6</sub> MIM]Br		Br <sup>-</sup>
1-octyl-3-methylimidazolium bromide	[C <sub>8</sub> MIM]Br		Br <sup>-</sup>
1-decyl-3-methylimidazolium bromide	[C <sub>10</sub> MIM]Br		Br <sup>-</sup>

**Table S2.** Recoveries of LA, LQ, ILA, ILQ and GA from licorice.

Analyte	Original (mg)	Added (mg)	Found (mg)	Recovery (%)	Mean (%)	RSD (%)
LA	3.09	3.04	6.00	95.78	101.51	3.54
	2.79	3.05	5.98	104.91		
	2.72	3.05	5.90	104.32		
	2.78	3.07	5.94	102.86		
	2.86	3.08	5.89	98.50		
	2.72	3.08	5.88	102.67		
LQ	4.91	4.06	8.94	99.09	101.19	2.95
	4.93	4.06	8.89	97.44		
	4.75	4.08	8.80	99.31		
	4.63	4.10	8.85	102.73		
	4.54	4.10	8.79	103.65		
	4.46	4.11	8.77	104.94		
ILA	0.67	0.59	1.25	97.15	101.68	2.67
	0.65	0.59	1.24	99.80		
	0.62	0.59	1.23	102.12		
	0.62	0.60	1.24	103.06		
	0.60	0.60	1.23	103.88		
	0.59	0.60	1.22	104.09		
ILQ	0.54	0.61	1.13	97.25	100.04	2.00
	0.54	0.61	1.14	98.46		
	0.53	0.61	1.13	99.22		
	0.51	0.61	1.14	102.17		
	0.50	0.61	1.13	101.53		
	0.50	0.62	1.12	101.57		
GA	12.21	9.09	20.95	96.10	98.69	3.12
	12.09	9.10	20.84	96.14		
	11.89	9.13	20.61	95.50		
	11.54	9.17	20.81	101.09		
	11.29	9.22	20.60	101.04		
	11.08	9.26	20.56	102.28		

Note: LA, liquiritin apioside; LQ, liquiritin; ILA, isoliquiritin apioside; ILQ, isoliquiritin; GA, glycyrrhizic acid.



**Fig. S1.** SEM graphics of licorice samples treated using different solvents. The samples were observed under  $2500\times$  magnification.