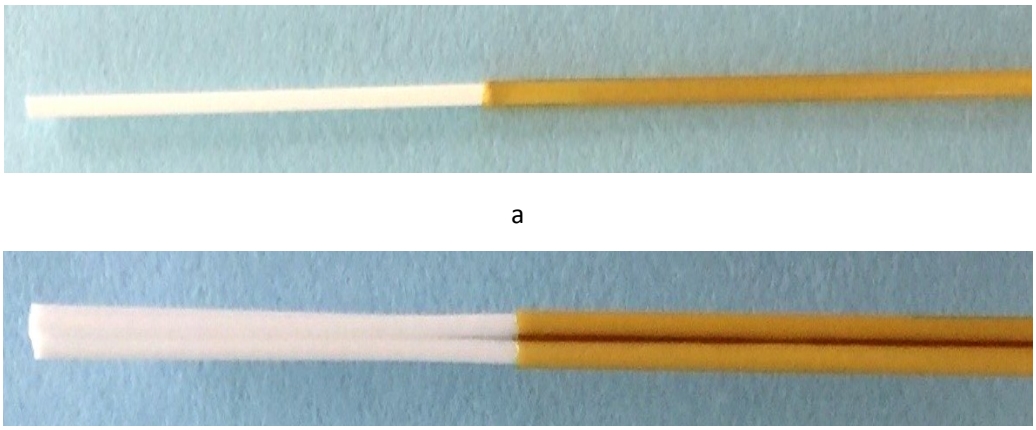
Electronic Supplementary Material (ESI) for Analyst.

Supporting information

Preparation and application of poly (ionic liquid)-based molecularly imprinted polymer for multiple monolithic fiber solid-phase microextraction of phenolic acids in fruit juice and beer samples

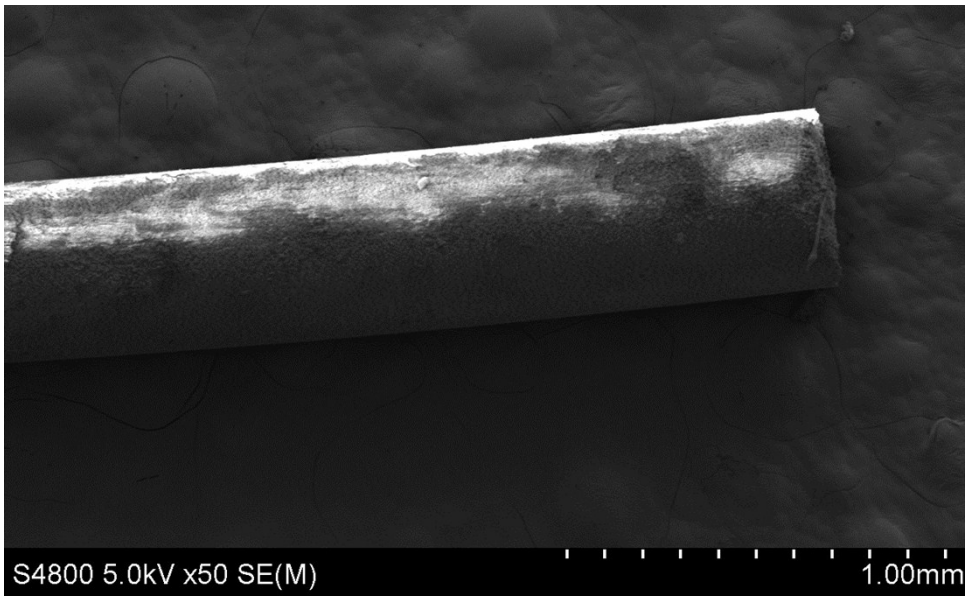
Lei Chen, Xiaojia Huang*



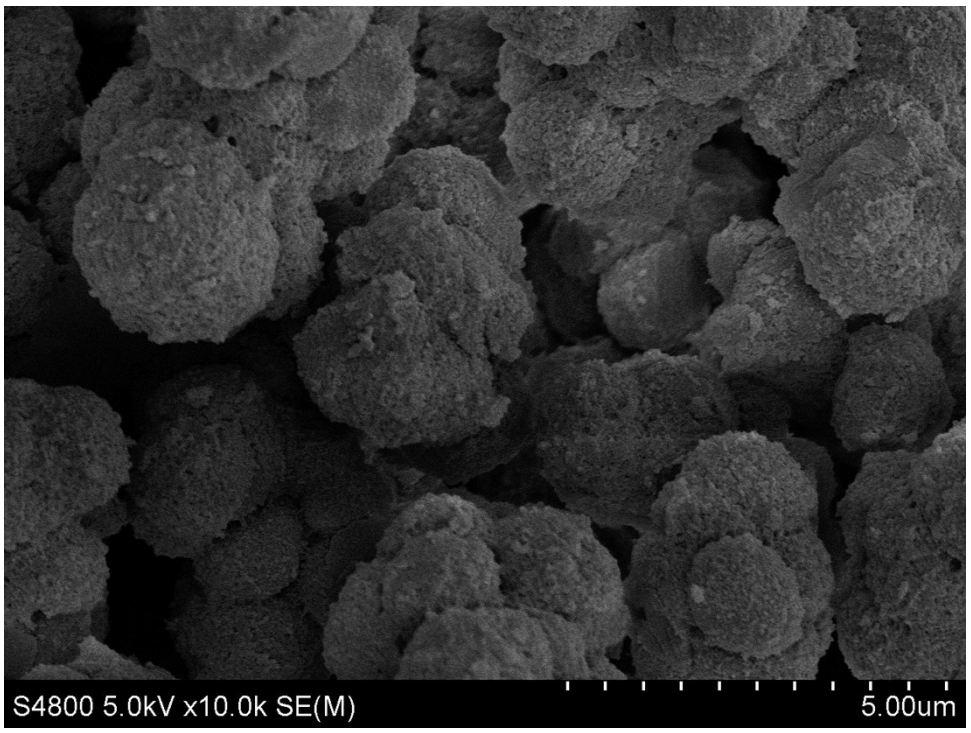
a

b

Fig.S1. The photos of single thin PIL/MIP fiber (a) and final PIL/MIP-MMF with four thin fibers (b)



a



b

Fig.S2. The SEM images of PIL/MIP at 50× (a) and 10000× (b) magnification

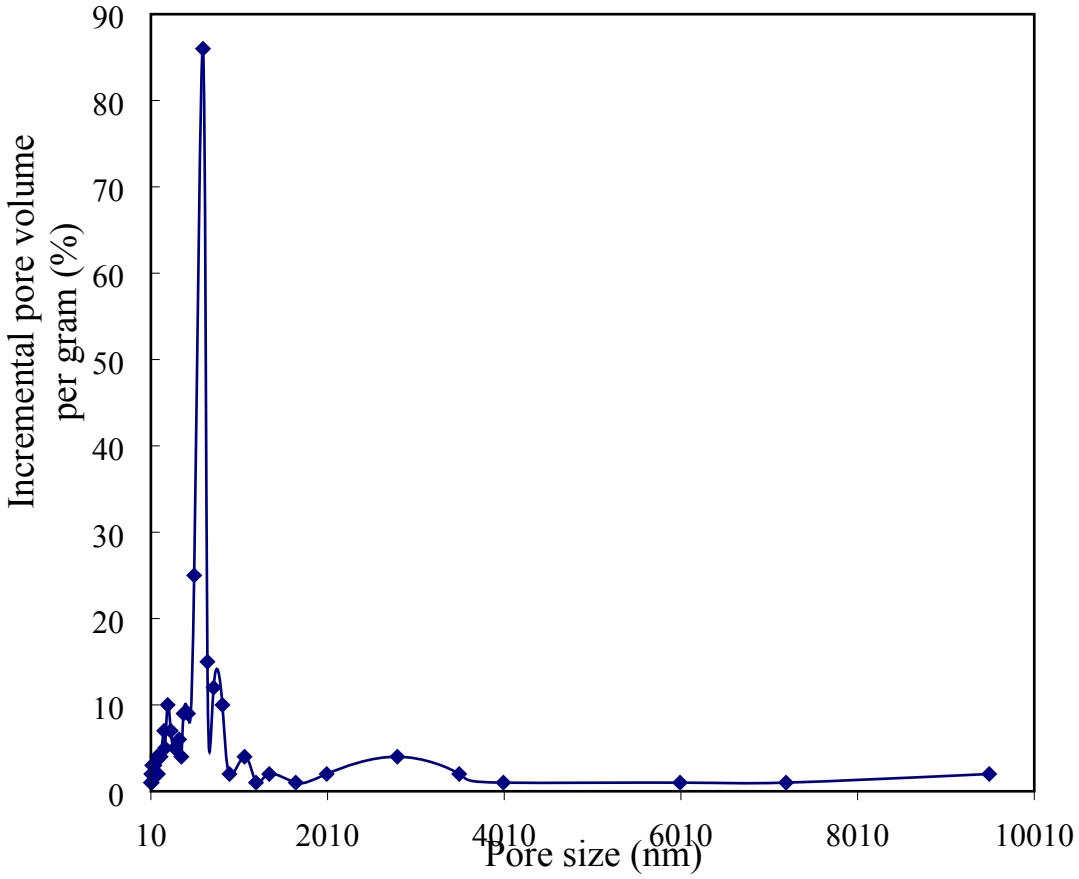


Fig.S3. The PSD plot of PIL/MIP

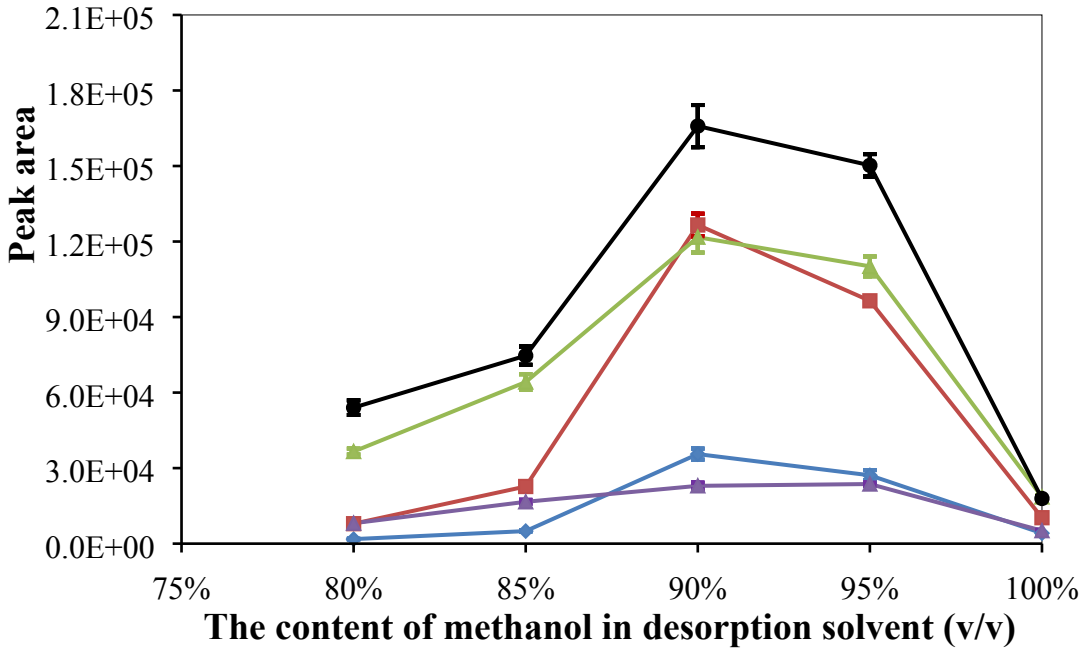


Fig.S4. The effect of desorption solvent on extraction efficiency

Conditions: Extraction and desorption time were 50 min and 40 min, respectively;

no salt was added in the sample and the pH values of sample matrix were not adjusted. The sample volume was 20 mL and spiked concentration was 100 μg/L for each analyte.

Symbols: ●FA; ①VA; ◴ CA; ◴DBA; ①HFA.

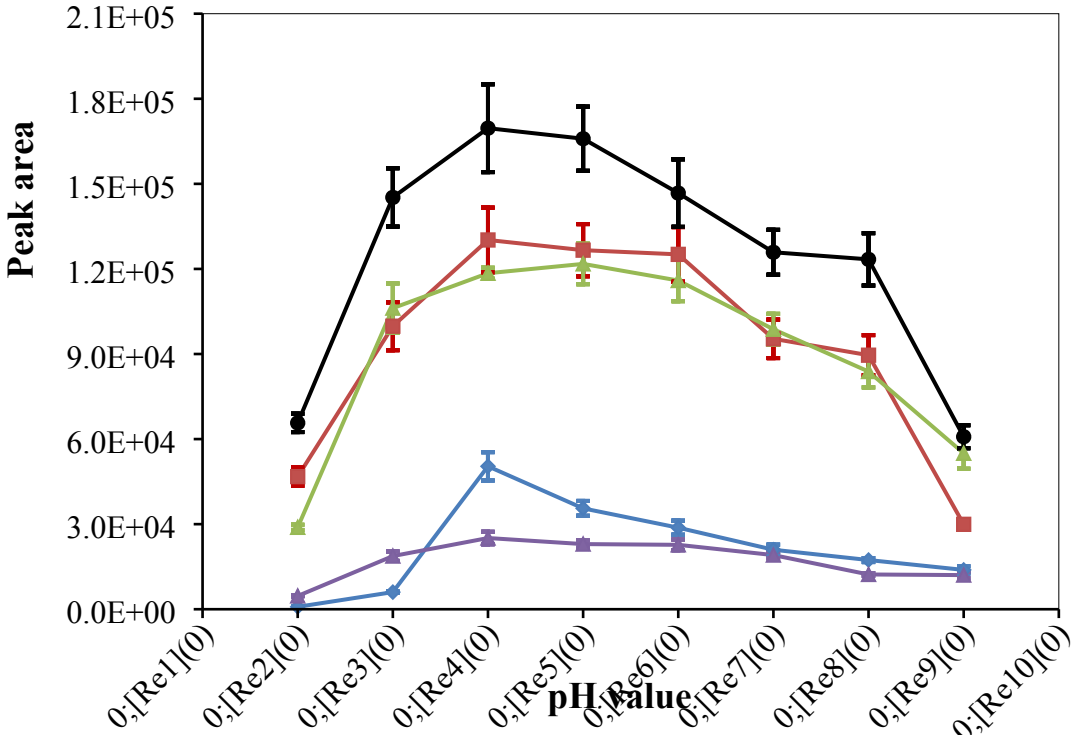


Fig.S5. The effect of sample pH value on extraction efficiency

Conditions: The mixture of methanol/0.5% formic acid aqueous solution (90/10, v/v) was used as desorption solvent. The other conditions were the same as in Fig.S4.

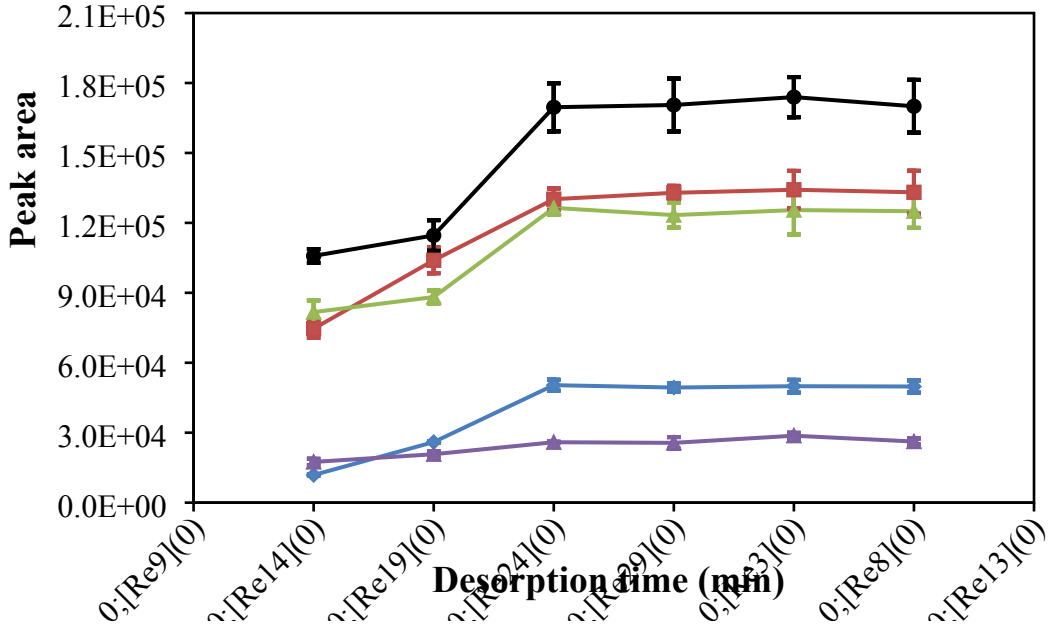


Fig.S6. The effect of desorption time on extraction efficiency

Conditions: Sample pH value was adjusted to 5.0 with 0.1 mol/L HCl. The other conditions were the same as in Fig.S5.

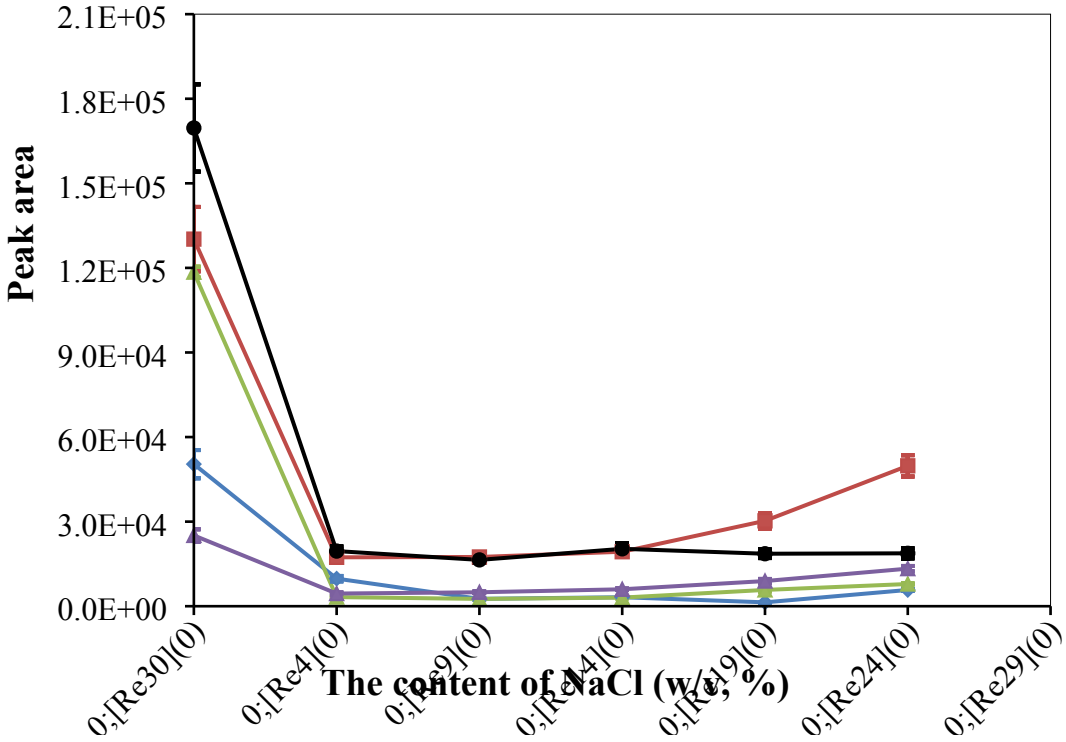
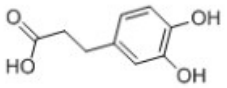
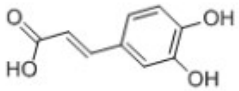
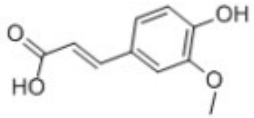
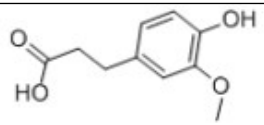
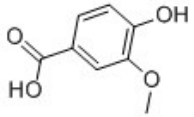
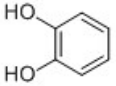


Fig.S7. The effect of ionic strength in sample matrix on extraction efficiency

Conditions: Desorption time was 25 min. The other conditions were the same as in Fig.S6.

Table S1. The chemical properties of PAs, catechol and benzene

Compounds	molecular formula	Molecular mass	CAS number	Chemical structures	Log*Kow* [a]	p*K*a
3,4-dihydroxybenzenepropanoic acid	$C_9H_{10}O_4$	182.17	1078-61-1		/	/
caffeic acid	$C_9H_8O_4$	180.16	331-39-5		1.15	4.77 [b]
ferulic acid	$C_{10}H_{10}O_4$	194.18	1135-24-6		1.58	4.61[b]
hydroferulic acid	$C_{10}H_{12}O_4$	196.2	1135-23-5		1.51	4.58 [a]
vanillic acid	$C_8H_8O_4$	168.15	121-34-6		1.43	4.51[a]
Catechol	$C_6H_6O_2$	110.11	120-80-9		0.88	9.45 [a]
Benzene	C_6H_6	78.11	200-753-7		2.13	/

a: http://chem.sis.nlm.nih.gov/chemidplus/ b: Mota F.L., Queimada A.J., Pinho S.P., Macedo E.A., 2008 (15): 5182-5189.

Table S2. Extraction efficiency of different PIL/MIP-MMF for PAs

Monomer mixture		Polymerization mixture			Peak area (mAU×min)				
AVC (%,w/w)	ED (%,w/w)	Monomer mixture (%,w/w)	Porogen solvent (%,w/w)	The amount of DBA (mg)	DBA	CA	VA	HFA	FA
40	60	50	50	15	6017	18421	32887	6826	36548
40	60	50	50	10	12007	2671	9204	2079	11659
40	60	50	50	5	18391	41029	70880	14406	88270
30	70	50	50	5	9175	4002	7041	2974	9741
35	65	50	50	5	13960	13601	32369	7640	42840
45	55	50	50	5	14272	8669	25579	5512	33166
50	50	50	50	5	3314	1665	7182	2629	9002
40	60	40	60	5	12441	14409	22708	4656	26516
40	60	45	55	5	15106	16996	28825	6111	32169
40	60	55	45	5	16024	25423	33756	8383	36056

Table S3. Kinetic constants for the pseudo-first-order rate and the pseudo-second-order rate equations

	Pseudo-first-order			Pseudo-second-order		
	R^2	K_1(min^{-1})	$Q_{m(cal)}$ (μg/g)	R^2	K_2(μg/(g·min))	$Q_{m\ (cal)}$ (μg/g)
MIPs	0.930	0.052	1550	0.982	0.065	1818
NIPs	0.779	0.031	620	0.966	0.031	909

Table S4. Adsorption isotherm constants for the Langmuir and Freundlich equations

	Langmuir			Freundlich		
	K (L/μg)	Q_m (μg/g)	R^2	n	K_F	R^2
MIPs	9.181	319	0.986	1.667	9.215	0.994
NIPs	17.07	31.3	0.864	3.487	5.181	0.756