Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Table S1
Experimental binodal data in mass fractions for PEG400(w_1)-salt(w_2) ATPS at 298.15 K[a] and 101.325 KPa[a].

$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$
PEG400-$(NH_4)_2SO_4$ ATPS							
52.038	0.761	31.296	7.874	14.956	18.28	6.212	25.484
47.117	2.178	29.206	9.025	13.729	19.057	4.902	26.731
44.231	2.793	25.896	11.121	12.253	20.107	3.451	27.767
41.813	3.401	23.224	12.993	10.863	21.136	1.867	30.564
38.972	4.344	20.518	14.723	10.097	22.249	1.335	32.435
35.652	5.702	18.307	16.147	8.966	23.169	0.980	33.949
33.313	6.861	16.507	17.303	7.192	24.587	0.688	35.838
PEG400-$K_3C_6H_5O_7$ ATPS							
45.651	12.859	30.066	19.591	17.190	29.341	9.590	36.138
41.500	14.463	27.183	21.707	15.942	30.211	8.495	37.223
40.208	14.914	24.508	24.106	14.495	31.349	7.283	38.402
38.119	15.462	22.213	25.658	13.263	32.369		
35.473	16.502	20.219	27.101	12.148	33.387		
33.029	17.749	18.538	28.346	10.772	34.813		
PEG400-K_2HPO_4 ATPS							
34.252	5.048	20.856	11.497	7.746	20.804	1.936	26.904
32.048	6.044	18.982	12.573	6.354	21.678	1.692	27.512
30.135	6.963	18.055	13.335	5.297	22.507	1.316	28.012
28.139	7.975	16.626	14.251	4.424	23.108	1.027	29.373
26.448	8.670	15.071	15.110	3.679	23.815	0.806	30.165
24.915	9.243	13.574	16.224	3.084	24.608	0.641	31.007
23.658	9.781	11.463	17.849	2.613	25.377	0.479	31.873
22.364	10.398	9.468	19.463	2.240	26.163	0.359	32.854

[a]Standard uncertainties of temperature and pressure: $u(T) = 0.05$ K; $u(P) = 10$ kPa.

Table S2

Experimental binodal data in mass fractions for PEG1000(w_1)-salt(w_2) ATPS at 298.15 K[a] and 101.325 kPa[a].

$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$
PEG1000-$(NH_4)_2SO_4$ ATPS							
43.362	2.348	26.305	7.794	11.975	14.977	5.160	19.150
39.241	3.650	23.130	8.804	10.025	16.079	3.309	20.361
33.680	4.812	20.777	10.406	8.292	17.165	2.231	21.388
31.336	5.686	18.214	11.585	7.130	17.955	1.390	23.250
28.651	6.809	14.163	12.924	6.043	18.617	0.693	25.994
PEG1000-$K_3C_6H_5O_7$ ATPS							
32.618	8.368	15.784	15.866	9.790	18.734	5.481	21.450
29.698	9.650	14.837	16.334	9.255	19.086	5.141	21.692
26.738	10.841	14.020	16.698	8.759	19.228	4.633	22.200
24.627	11.977	13.321	17.007	8.333	19.340	4.183	22.650
23.160	12.647	12.662	17.284	7.894	19.603	3.698	23.148
21.797	13.186	12.101	17.575	7.381	19.930	3.259	23.641
20.634	13.635	11.564	17.857	6.998	20.220	2.866	24.124
19.096	14.382	11.106	18.111	6.642	20.456		
17.953	14.647	10.660	18.295	6.261	20.784		
16.856	15.215	10.256	18.446	5.843	21.165		
PEG1000-K_2HPO_4 ATPS							
35.702	4.135	20.396	8.674	7.835	14.317	0.799	19.485
32.420	4.798	19.401	9.085	6.713	14.700	0.586	21.283
29.971	5.617	17.399	9.747	5.805	15.314	0.459	22.606
28.068	6.001	15.683	10.534	5.031	15.837	0.358	23.335
26.272	6.546	14.239	11.391	3.707	16.494	0.225	24.510
24.790	7.100	11.859	12.457	2.249	17.116		
23.335	7.549	10.106	13.299	1.043	18.768		

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S3
Experimental binodal data in mass fractions for PEG2000(w_1)-salt(w_2) ATPS at 298.15 K[a] and 101.325 kPa[a].

$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$
PEG2000-$(NH_4)_2SO_4$ ATPS							
40.558	2.492	19.171	7.994	8.819	13.311	3.019	17.065
37.256	3.148	17.331	8.914	7.931	13.590	2.625	17.549
34.792	3.988	15.125	10.109	6.706	14.313	1.944	17.989
31.148	4.820	14.250	10.555	5.755	14.939	1.419	18.375
28.375	5.318	12.102	11.425	4.874	15.513	1.060	18.971
25.999	5.887	10.997	11.939	4.355	15.913	0.638	19.856
21.897	7.136	10.440	12.363	3.453	16.494		
PEG2000-$K_3C_6H_5O_7$ ATPS							
31.501	5.713	17.440	11.072	8.800	15.657	1.817	21.660
28.209	6.841	16.600	11.589	8.088	16.251	1.610	21.758
26.991	7.238	15.639	12.023	7.292	16.840	1.357	22.316
25.615	7.755	14.876	12.499	6.464	17.636	1.144	22.914
24.590	8.134	14.077	12.580	5.660	18.426	0.913	23.724
23.354	8.742	13.381	12.621	4.977	18.892	0.674	24.875
22.372	9.095	12.805	13.100	4.308	19.306	0.653	24.098
21.486	9.379	12.143	13.658	3.704	19.633	0.616	22.744
20.772	9.660	11.516	13.914	3.230	20.032	0.653	22.744
20.120	9.910	10.783	14.433	2.780	20.583		
19.452	10.129	10.085	14.908	2.414	20.920		
18.513	10.670	9.467	15.228	2.082	21.403		
PEG2000-K_2HPO_4 ATPS							
39.626	2.178	19.018	5.625	6.144	10.449	0.402	16.717
34.949	2.680	15.628	6.659	4.900	11.444	0.337	17.523
31.733	3.256	13.094	7.114	3.730	12.284	0.261	18.628
29.269	3.715	11.482	7.698	2.993	13.071	0.203	19.420
26.968	4.123	9.365	8.498	2.076	13.607	0.161	20.860
24.754	4.513	8.632	9.256	1.575	14.059		
23.094	4.642	7.412	9.671	0.941	15.032		
21.023	5.156	6.92	9.982	0.787	15.962		

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S4

Experimental binodal data in mass fractions for PEG4000(w_1)-salt (w_2) ATPS at 298.15 K[a] and 101.325 kPa[a].

$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$	$100w_1$	$100w_2$
PEG4000-$(NH_4)_2SO_4$ ATPS							
45.014	1.266	22.451	5.747	9.662	10.111	1.825	13.706
41.346	1.902	20.719	6.142	9.366	10.127	1.404	14.087
36.846	2.750	19.252	6.696	7.747	10.819	0.840	14.795
33.587	3.296	18.161	6.983	6.448	11.422	0.459	15.538
30.399	4.049	16.206	7.489	5.620	11.857	0.328	16.539
27.957	4.514	14.355	8.199	4.269	12.351	0.164	17.037
26.702	4.825	12.999	8.810	3.167	12.672		
24.403	5.308	11.400	9.378	2.372	13.220		
PEG4000-$K_3C_6H_5O_7$ ATPS							
29.949	4.938	12.990	10.760	7.290	13.637	1.700	17.624
26.459	6.079	12.069	10.989	6.870	13.991	1.560	18.561
26.459	6.079	11.928	11.361	6.270	14.317	1.182	18.967
23.610	6.708	11.788	11.645	5.453	14.590	0.689	19.607
21.966	7.312	11.349	11.701	5.236	15.113	0.513	20.046
20.229	7.849	10.840	11.855	5.015	15.208	0.501	20.512
18.570	8.488	10.462	11.990	4.895	15.700	0.471	21.038
17.325	8.878	10.028	12.364	4.345	15.764	0.419	21.807
16.296	9.393	9.799	12.703	3.901	16.094	0.270	22.311
15.381	9.786	9.235	12.896	3.458	16.320	0.180	23.394
14.472	10.141	8.920	13.184	2.891	16.602	0.105	24.178
13.575	10.567	7.909	13.316	2.057	16.955		
PEG4000-K_2HPO_4 ATPS							
29.774	1.807	11.762	4.987	4.354	9.531	1.166	12.886
25.230	1.912	10.207	5.661	3.695	9.961	0.896	13.510
21.920	2.090	9.750	6.087	3.256	10.287	0.693	13.892
19.870	2.356	9.056	6.385	3.154	10.632	0.521	14.709
17.620	2.873	8.093	7.081	2.697	10.924	0.387	15.212
16.042	3.311	6.787	7.747	2.566	11.278	0.376	15.708
14.750	3.687	5.938	8.328	1.824	12.063		
13.303	4.084	5.020	9.059	1.501	12.577		

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S5

Value of fitting parameters of Equation 7 for binodal data of PEG-salt ATPS at 298.15 K[a] and 101.325 kPa[a].

	a	b	c	d	R^2	100sd[a]
			PEG-$(NH_4)_2SO_4$ ATPS			
PEG400	-0.35303	-3.68286	5.57285	-30.44505	0.99784	0.12600
PEG1000	0.14889	-9.03954	19.45296	-78.10975	0.99724	0.07852
PEG2000	0.20489	-9.67614	20.05261	-105.35207	0.99713	0.10900
PEG4000	-0.14182	-7.53197	18.22119	-170.96386	0.99787	0.11000
			PEG-$K_3C_6H_5O_7$ ATPS			
PEG400	6.09643	-37.03296	56.26374	-49.99948	0.99924	0.02188
PEG1000	1.97133	-23.09237	52.91806	-120.18344	0.99945	0.01245
PEG2000	1.66244	-21.31430	47.12112	-124.36448	0.99825	0.05823
PEG4000	3.03322	-35.58803	85.88786	-226.26962	0.99791	0.05683
			PEG-K_2HPO_4 ATPS			
PEG400	1.06831	-16.23062	34.15983	-79.01709	0.99875	0.04234
PEG1000	2.84156	-35.03202	88.70531	-238.48584	0.99865	0.03889
PEG2000	-0.22212	-3.90536	-4.18574	-83.90421	0.99887	0.04124
PEG4000	3.41658	-56.11184	167.5267	-569.22517	0.99367	0.10800

$sd^a = (\sum_{i=1}^{n} (w_1^{cal} - w_1^{\exp})^2 / N)^{0.5}$, where w_1 and N are the mass fractions of PEG and the number of binodal points, respectively. w_1^{exp} is the experimental mass fraction of PEG, and w_1^{cal} is the corresponding data calculated using eq 7.

Table S6
Value of fitting parameters of Equation 8 for binodal data of PEG-salt ATPS at 298.15 K[a] and 101.325 kPa[a].

	a	b	c	d	R^2	100sd[a]
			PEG-$(NH_4)_2SO_4$ ATPS			
PEG400	0.51178	-0.270015	3.93045	-0.84456	0.99869	0.31780
PEG1000	0.49965	-3.47771	5.70140	1.60889	0.99943	0.40340
PEG2000	0.51679	-5.06880	15.08817	-11.83723	0.99971	0.19650
PEG4000	0.51836	-6.07505	17.96931	0.84940	0.99979	0.27640
			PEG-$K_3C_6H_5O_7$ ATPS			
PEG400	4.88752	-5.14570	-1.92838	-0.17219	0.99898	0.23650
PEG1000	0.42709	-15.02506	-0.07426	40.77208	0.99998	0.30380
PEG2000	0.54638	-2.05019	-1.24224	11.48332	0.99992	0.49370
PEG4000	0.67186	-1.75115	-1.48594	12.57309	0.99964	0.27860
			PEG-K_2HPO_4 ATPS			
PEG400	0.46105	-1.83591	-1.09532	6.09833	0.99966	0.30180
PEG1000	0.51358	-2.65631	-1.13540	19.39792	0.99930	0.27810
PEG2000	2.06401	-2.70530	-1.87288	22.27260	0.99967	0.37670
PEG4000	5.17240	-5.43030	-1.97619	5.63522	0.98987	0.19820

$sd^a = (\sum_{i=1}^{n} (w_1^{cal} - w_1^{\exp})^2 / N)^{0.5}$, where w_1 and N are the mass fractions of PEG and the number of binodal points, respectively. w_1^{exp} is the experimental mass fraction of PEG, and w_1^{cal} is the corresponding data calculated using eq 8.

Table S7

Value of fitting parameters of Equation 9 for binodal data of PEG-salt ATPS at 298.15 K[a] and 101.325 kPa[a].

	a	b	c	R^2	100sd[a]
			PEG-$(NH_4)_2SO_4$ ATPS		
PEG400	-0.30287	-0.27401	0.06548	0.99713	0.28930
PEG1000	-0.29207	-0.36924	0.03926	0.99566	0.24700
PEG2000	-0.25393	-0.39472	0.01657	0.99802	0.18270
PEG4000	-0.27858	-0.48833	0.02016	0.99428	0.30280
			PEG-$K_3C_6H_5O_7$ ATPS		
PEG400	-0.35637	-0.25749	0.00918	0.99792	0.19250
PEG1000	-0.37073	-0.45853	0.03310	0.99362	0.28740
PEG2000	-0.21963	-0.32039	-0.00441	0.99632	0.21760
PEG4000	-0.16139	-0.27191	-0.02337	0.98555	0.23650
			PEG-K_2HPO_4 ATPS		
PEG400	-0.23577	-0.26616	0.02150	0.99285	0.30870
PEG1000	-0.21898	-0.34456	-0.00215	0.98878	0.31220
PEG2000	-0.17220	-0.33273	-0.00821	0.99192	0.28730
PEG4000	-0.07908	-0.15409	-0.01383	0.99119	0.32560

$sd^a = (\sum_{i=1}^{n}(w_1^{cal} - w_1^{\exp})^2 / N)^{0.5}$, where w_1 and N are the mass fractions of PEG and the number of binodal points, respectively. w_1^{exp} is the experimental mass fraction of PEG, and w_1^{cal} is the corresponding data calculated using eq 9.

Table S8

The data of tie lines in mass fractions for PEG-$(NH_4)_2SO_4$ ATPS at 298.15 K[a] and 101.325 kPa[a].

Total system		Polymer rich phase		Salt rich phase		Slope (k)	average of slope
$100w_1$	$100w_2$	$100w_1^t$	$100w_2^t$	$100w_1^b$	$100w_2^b$		
PEG400-$(NH_4)_2SO_4$-H_2O							
20.977	20.440	45.697	2.100	1.340	35.010	-1.3478	-1.3197
21.165	21.05	47.267	1.320	1.056	36.250	-1.3233	
22.392	21.725	49.435	1.090	0.577	38.210	-1.3162	
22.135	23.57	51.618	0.420	0.436	40.050	-1.2915	
PEG1000-$(NH_4)_2SO_4$-H_2O							
15.601	14.695	28.721	6.810	2.196	22.900	-1.6483	-1.4982
15.314	15.587	29.609	6.450	1.359	24.680	-1.5496	
15.820	16.500	30.722	6.010	0.596	27.420	-1.4070	
16.039	17.460	33.510	4.980	0.370	28.860	-1.3879	
PEG2000-$(NH_4)_2SO_4$-H_2O							
14.221	11.450	25.495	6.260	3.981	16.260	-2.1517	-1.9753
14.980	12.320	29.875	4.930	1.801	18.980	-1.9985	
15.100	12.861	31.187	4.570	1.231	20.140	-1.9244	
15.760	13.210	32.141	4.320	0.762	21.500	-1.8267	
PEG4000-$(NH_4)_2SO_4$-H_2O							
13.214	9.869	25.826	5.070	2.258	14.110	-2.6075	-2.5145
16.590	10.060	34.605	3.060	0.898	16.260	-2.5539	
18.200	10.574	39.875	2.060	0.452	17.680	-2.5246	
21.700	10.702	43.780	1.480	0.138	19.880	-2.3719	

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S9

The data of tie lines in mass fractions for PEG-$K_3C_6H_5O_7$ ATPS at 298.15 K[a] and 101.325 kPa[a].

Total system		Polymer rich phase		Salt rich phase		Slope (k)	average of slope
$100w_1$	$100w_2$	$100w_1^t$	$100w_2^t$	$100w_1^b$	$100w_2^b$		
PEG400-$K_3C_6H_5O_7$-H_2O							
25.010	24.981	39.179	15.080	10.065	35.50	-1.4257	
25.320	25.580	41.065	14.380	9.727	36.050	-1.4461	-1.4696
25.160	26.310	44.186	13.380	8.678	37.110	-1.4963	
25.410	26.710	46.360	12.780	7.115	38.760	-1.5106	
PEG1000-$K_3C_6H_5O_7$-H_2O							
16.010	16.410	29.744	9.620	4.656	22.130	-2.0924	
16.203	16.730	31.234	8.950	3.168	23.600	-1.9961	-1.9777
16.105	17.100	31.980	8.620	2.410	24.560	-1.9229	
16.100	17.420	34.050	7.740	2.013	25.160	-1.8997	
PEG2000-$K_3C_6H_5O_7$-H_2O							
15.000	13.200	24.128	8.280	3.948	19.270	-1.8356	
15.060	13.860	25.988	7.570	2.236	21.370	-1.7207	-1.6879
15.100	14.370	27.040	7.190	1.497	22.690	-1.6476	
15.300	14.930	27.824	6.920	0.867	24.330	-1.5480	
PEG4000-$K_3C_6H_5O_7$-H_2O							
13.120	11.510	20.475	7.820	3.235	16.560	-1.9715	
13.090	12.030	22.994	6.930	2.109	17.790	-1.9228	-1.8661
13.540	12.510	24.760	6.370	1.097	19.440	-1.8102	
13.780	13.040	26.486	5.880	0.670	20.550	-1.7597	

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S10

The data of tie lines in mass fractions for PEG-K_2HPO_4 ATPS at 298.15 K[a] and 101.325 kPa[a].

Total system		Polymer rich phase		Salt rich phase		Slope (k)	average of slope
$100w_1$	$100w_2$	$100w_1^t$	$100w_2^t$	$100w_1^b$	$100w_2^b$		
			PEG400-K_2HPO_4-H_2O				
16.172	16.691	28.642	7.380	1.700	27.700	-1.3256	-1.2848
15.318	18.056	30.680	6.480	1.260	28.850	-1.3482	
17.038	18.385	32.720	5.710	0.514	31.990	-1.2253	
16.400	19.530	33.312	5.510	0.366	33.070	-1.2399	
			PEG1000-K_2HPO_4-H_2O				
10.813	15.022	25.636	6.770	0.682	20.770	-1.7834	-1.6496
11.540	15.721	28.409	5.850	0.289	22.420	-1.6979	
12.440	16.230	29.985	5.400	0.170	23.970	-1.6064	
12.740	17.290	31.364	5.050	0.0355	25.80	-1.5107	
			PEG2000-K_2HPO_4-H_2O				
10.000	12.346	24.755	4.440	0.610	17.470	-1.9079	-1.9359
12.720	18.890	30.077	3.500	0.250	19.770	-1.9588	
14.380	13.170	33.249	3.010	0.152	20.980	-1.9215	
16.342	13.592	38.230	2.330	0.094	22.100	-1.9557	
			PEG4000-K_2HPO_4-H_2O				
5.694	9.600	13.111	4.090	0.795	13.300	-1.3379	-1.3632
5.815	10.000	14.639	3.530	0.529	13.940	-1.3562	
6.132	10.980	17.591	2.830	0.201	15.280	-1.3980	
6.024	11.870	18.609	2.660	0.088	16.280	-1.3608	

[a]Standard uncertainties of temperature and pressure: u(T) = 0.05 K; u(P) = 10 kPa.

Table S11

Values of parameters of Equations (14) and (15) for the PEG-K_2HPO_4/$K_3C_6H_5O_7$/$(NH_4)_2SO_4$ ATPSs at 298.15 K[a] and 101.325 kPa[a].

T/K	k_1	n	k_2	r	R_1^2	R_2^2	sd_1^α	sd_2^α
PEG-$(NH_4)_2SO_4$ ATPS								
PEG400	0.8030	1.0934	1.2255	0.9686	0.954	0.996	0.6391	0.2494
PEG1000	1.0623	0.6462	1.0108	1.3912	0.8712	0.8774	0.8199	0.2908
PEG2000	0.7932	0.9714	1.3336	0.9513	0.9773	0.9713	0.4951	0.2554
PEG4000	0.3274	1.9816	1.7743	0.4840	0.9679	0.9614	0.2266	0.8656
PEG-$K_3C_6H_5O_7$ ATPS								
PEG400	0.6990	2.0799	1.1802	0.3194	0.9529	0.9650	0.6442	0.2705
PEG1000	1.2299	1.0699	1.3213	0.7608	0.9052	0.9133	0.6190	0.2806
PEG2000	1.0898	0.6566	0.9739	1.4094	0.9853	0.9799	0.7853	0.2906
PEG4000	0.7611	1.2179	1.3201	0.7569	0.9829	0.9799	0.6909	0.3191
PEG-K_2HPO_4 ATPS								
PEG400	1.0521	0.8055	0.9882	1.2229	0.9504	0.9488	0.9905	0.3139
PEG1000	0.8867	0.9870	1.1678	1.0196	0.9658	0.9658	0.7303	0.2833
PEG2000	0.4006	2.0864	1.5653	0.4764	0.9794	0.9805	0.4698	0.6622
PEG4000	0.5265	1.7859	1.4566	0.5468	0.9755	0.9743	0.9102	0.5419

[a] $sd = \left[\sum_{i=1}^{N} \left(\left(w_{i,j,cal}^{top} - w_{i,j,\exp}^{top} \right)^2 + \left(w_{i,j,cal}^{bot} - w_{i,j,\exp}^{bot} \right)^2 \right) / 2N \right]^{0.5}$, where N is the number of tie lines and j = 1 and j = 2, sd_1 and sd_2 represent the mass percent standard deviations for PEG and salt, respectively.

Table S12

Extraction efficiencies of nine model compounds by PEG (0.18, *w*/*w*)-$(NH_4)_2SO_4$ ATPE.

w_{salt}	$w_{PEG=0.18}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	81.68 ± 0.03	75.05 ± 0.06	72.60 ± 0.09	85.74 ± 0.09	73.32 ± 0.06	94.06 ± 0.10	82.61 ± 0.01	85.17 ± 0.11	84.04 ± 0.08
	PEG2000	71.25 ± 0.08	70.06 ± 0.09	58.40 ± 0.13	74.29 ± 0.14	70.37 ± 0.09	76.12 ± 0.06	73.32 ± 0.08	77.17 ± 0.06	74.71 ± 0.02
	PEG1000	70.78 ±0.06	68.28 ± 0.09	57.33 ± 0.07	72.37 ± 0.13	69.53 ± 0.03	68.90 ± 0.09	62.87 ± 0.08	73.42 ± 0.05	70.38 ± 0.01
	PEG400	64.33 ± 0.07	65.24 ± 0.02	57.07 ± 0.11	70.16 ± 0.01	61.49 ± 0.09	67.13 ± 0.07	61.11 ± 0.02	72.80 ± 0.14	68.52 ± 0.14
0.19	PEG4000	79.05 ± 0.11	74.93 ± 0.01	74.14 ± 0.07	82.49 ± 0.05	67.85 ± 0.08	93.70 ± 0.12	83.72 ± 0.05	84.83 ± 0.10	85.95 ± 0.05
	PEG2000	63.50 ± 0.04	69.70 ± 0.06	60.27 ± 0.02	73.44 ± 0.14	61.35 ± 0.13	60.95 ± 0.07	71.18 ± 0.07	78.86 ± 0.08	69.04 ± 0.14
	PEG1000	57.80 ± 0.06	66.29 ± 0.14	63.18 ± 0.07	71.36 ± 0.05	60.81 ± 0.03	61.84 ± 0.06	65.53 ± 0.03	75.34 ± 0.14	67.29 ± 0.03
	PEG400	56.88 ± 0.09	64.08 ± 0.11	57.00 ± 0.02	69.07 ± 0.01	55.42 ± 0.14	66.99 ± 0.11	60.91 ± 0.16	71.22 ± 0.03	65.37 ± 0.06
0.20	PEG4000	77.27 ± 0.09	82.77 ± 0.06	71.57 ± 0.07	85.06 ± 0.05	78.65 ± 0.10	92.74 ± 0.08	81.19 ± 0.07	87.05 ± 0.13	84.83 ± 0.01
	PEG2000	61.60 ± 0.06	71.54 ± 0.04	67.20 ± 0.01	81.29 ± 0.11	70.92 ± 0.14	86.13 ± 0.15	70.10 ± 0.02	80.47 ± 0.02	70.56 ± 0.14
	PEG1000	68.28 ± 0.08	68.87 ± 0.06	67.80 ± 0.02	75.14 ± 0.03	68.36 ± 0.01	77.74 ± 0.14	59.45 ± 0.03	77.61 ± 0.11	66.37 ± 0.04
	PEG400	53.52 ± 0.06	61.56 ± 0.13	64.46 ± 0.04	70.25 ± 0.09	65.40 ± 0.05	61.84 ± 0.14	61.11 ± 0.13	73.65 ± 0.03	63.98 ± 0.11

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S13

Extraction efficiencies of nine model compounds by PEG (0.20, *w*/*w*)-$(NH_4)_2SO_4$ ATPE.

w_{salt}	$w_{PEG=0.20}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	85.41 ± 0.11	86.35 ± 0.08	82.94 ± 0.05	85.92 ±0.11	82.22 ±0.04	96.60 ±0.06	84.03 ±0.06	87.74 ± 0.10	86.65 ± 0.04
	PEG2000	68.28 ± 0.06	75.36 ± 0.07	66.90 ± 0.01	75.21 ±0.09	77.18 ±0.02	81.27 ±0.13	67.6 ±0.13	83.52 ±0.06	84.28 ±0.15
	PEG1000	70.3 ± 0.04	72.39 ±0.15	62.05 ±0.11	73.35 ±0.18	73.16 ±0.04	74.65 ±0.17	67.09 ±0.13	79.21 ±0.18	73.46 ±0.15
	PEG400	57 ±0.06	62.39 ± 0.11	61.53 ±0.06	69.24 ±0.03	70.09 ±0.05	53.59 ±0.03	58.25 ±0.09	77.45 ±0.04	69.56 ±0.07
0.19	PEG4000	82.45 ± 0.06	84.25 ± 0.03	82.65 ± 0.08	86.67 ±0.08	86.37 ±0.01	93.69 ±0.06	86.02 ±0.04	87.82 ± 0.05	86.77 ± 0.07
	PEG2000	77.39 ± 0.02	74.06 ±0.06	79.02 ± 0.05	79.89 ±0.06	72.85 ±0.14	88.63 ±0.03	69.67 ±0.09	81.74 ±0.07	80.46 ± 0.02
	PEG1000	60.6 ±0.08	70.29 ±0.04	76.45 ±0.03	77.12 ±0.02	71.54 ±0.02	54.48 ±0.06	61.01 ±0.08	78.69 ±0.09	77.45 ±0.06
	PEG400	53.33 ± 0.07	67.34 ±0.09	75.73 ±0.08	76.25 ±0.01	60.49 ±0.09	76.27 ±0.06	57.94 ±0.08	76.10 ±0.06	73.56 ±0.02
0.20	PEG4000	81.08 ± 0.05	82.96 ± 0.05	82.20 ± 0.11	86.74 ±0.07	82.5 ±0.10	91.23 ±0.09	85.65 ±0.13	89.42 ± 0.12	87.74 ± 0.09
	PEG2000	62.05 ±0.06	71.67 ±0.03	65.7 ± 0.05	80.01 ±0.06	70.83 ±0.13	90.69 ±0.15	64.64 ±0.06	81.52 ±0.18	79.46 ±0.18
	PEG1000	58.08 ± 0.04	65.45 ±0.06	61.48 ± 0.11	78.25 ±0.12	65.23 ±0.11	82.45 ±0.18	67.79 ±0.06	76.89 ±0.17	72.67 ±0.06
	PEG400	60 ± 0.11	60.35 ± 0.07	60.29 ±0.08	73.56 ±0.09	60.14 ±0.06	70.82 ±0.02	60.67 ±0.06	74.32 ±0.01	70.35 ±0.09

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S14

Extraction efficiencies of nine model compounds by PEG (0.22, *w*/*w*)-$(NH_4)_2SO_4$ ATPE.

w_{salt}	$w_{PEG=0.22}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	84.79 ± 0.12	88.87 ± 0.06	83.25 ± 0.05	84.67 ± 0.11	82.22 ± 0.14	93.37 ± 0.10	80.80 ±0.04	87.21 ± 0.05	83.39 ±0.08
	PEG2000	70.46 ± 0.07	65.54 ± 0.06	71.10 ± 0.07	74.35 ± 0.07	76.57 ± 0.02	90.11 ± 0.07	63.1 ±0.07	80.47 ± 0.07	78.29 ±0.07
	PEG1000	71.57 ±0.07	64.35 ± 0.01	70.05 ±0.07	72.30 ± 0.03	70.98 ±0.07	70.67 ±0.07	68.37 ±0.07	77.13 ±0.07	73.97 ±0.07
	PEG400	60.55 ±0.07	60.35 ±0.07	67.43 ± 0.13	70.29 ± 0.09	67.43 ±0.07	69.64 ± 0.14	55.08 ±0.07	75.80 ±0.07	67.45 ±0.07
0.19	PEG4000	82.50 ± 0.05	89.24 ± 0.12	83.60 ± 0.12	83.11 ± 0.06	84.10 ± 0.04	91.23 ± 0.06	83.39 ±0.12	87.02 ± 0.12	84.03 ±0.09
	PEG2000	69.30 ±0.07	67.79 ± 0.05	72.33 ±0.07	79.73 ± 0.11	80.57 ±0.07	64.93 ±0.07	68.64 ±0.07	81.94 ±0.07	78.45 ±0.02
	PEG1000	52.50 ±0.07	65.30 ± 0.01	67.77 ±0.07	74.27 ± 0.03	73.05 ±0.07	70.81 ±0.07	62.28 ±0.07	76.20 ±0.07	72.77 ±0.07
	PEG400	57.74 ±0.07	63.49 ±0.07	66.43 ±0.07	71.19 ±0.07	71.49 ±0.07	66.4 ±0.07	56.7 ±0.07	73.08 ±0.07	69.35 ±0.07
0.20	PEG4000	81.60 ± 0.12	82.53 ± 0.12	77.58 ± 0.08	83.65 ± 0.12	77.77 ± 0.08	94.06 ± 0.09	81.76 ±0.01	86.02 ± 0.05	83.03 ±0.12
	PEG2000	64.60 ±0.07	65.47 ± 0.05	66.18 ± 0.04	80.41 ±0.07	75.92 ±0.07	74.5 ±0.07	67.6 ±0.07	80.63 ±0.07	76.12 ±0.07
	PEG1000	61.80 ±0.05	62.38 ±0.06	64.75 ± 0.11	78.23 ± 0.07	73.62 ±0.02	74.2 ± 0.06	66.74 ±0.04	75.75 ± 0.09	75.38 ±0.07
	PEG400	55.00 ± 0.02	60.22 ±0.07	62.30 ± 0.04	75.90 ± 0.03	70.93 ± 0.02	70.67 ± 0.13	55.82 ±0.07	72.44 ±0.06	70.45 ±0.08

Table S15

Extraction efficiencies of nine model compounds by PEG(0.18, *w*/*w*)-K_2HPO_4 ATPE.

w_{salt}	$w_{PEG=0.18}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	75.00 ±0.11	73.54 ±0.16	72.19 ±0.12	78.29 ± 0.17	67.10 ±0.12	65.96 ±0.03	62.84 ±0.09	78.35 ±0.05	75.26 ±0.06
	PEG2000	60.50 ±0.09	71.34 ±0.09	60.91 ±0.04	73.78 ±0.09	66.91 ±0.09	80.09 ±0.09	67.09 ±0.07	75.23 ±0.09	72.98 ±0.09
	PEG1000	64.2 ±0.02	67.59 ±0.09	58.85 ±0.05	71.24 ±0.19	68.34 ±0.01	77.74 ±0.17	64.49 ±0.03	73.87 ±0.01	67.45 ±0.14
	PEG400	53.7 ±0.06	63.65 ±0.08	53.22 ±0.02	68.89 ± 0.13	61.36 ±0.06	72.44 ±0.11	50.16 ±0.04	70.80 ±0.13	65.68 ±0.09
0.19	PEG4000	74.48 ±0.02	73.67 ±0.06	71.75 ±0.05	79.35 ± 0.01	65.18 ±0.02	63.16 ±0.01	71.67 ±0.03	77.18 ±0.05	70.17 ±0.08
	PEG2000	52.67 ±0.03	70.27 ±0.15	61.60 ±0.11	73.92 ±0.09	59.72 ±0.02	72.88 ±0.07	65.10 ±0.02	75.09 ±0.05	71.27 ±0.07
	PEG1000	54.18 ±0.02	63.48 ±0.03	59.47 ±0.01	70.08 ±0.09	58.46 ±0.12	74.50 ±0.04	65.35 ±0.07	73.24 ±0.06	66.24 ±0.02
	PEG400	45.62 ±0.06	63.19 ±0.02	52.43 ±0.01	65.72 ±0.12	57.87 ±0.02	68.90 ±0.03	57.04 ±0.04	69.87 ±0.07	62.63 ±0.08
0.20	PEG4000	75.68 ±0.02	71.23 ±0.01	68.20 ±0.14	80.35 ± 0.09	69.06 ±0.05	84.81 ±0.05	64.63 ±0.07	75.21 ±0.03	69.27 ±0.07
	PEG2000	66.18 ±0.02	71.01 ±0.11	65.91 ±0.09	77.80 ±0.09	68.99 ±0.13	63.16 ±0.09	60.40 ±0.09	71.36 ±0.09	70.83 ±0.09
	PEG1000	63.18 ±0.06	66.49 ±0.09	62.90 ±0.04	74.23 ±0.11	67.98 ±0.12	72.73 ±0.07	58.24 ±0.02	68.90 ±0.02	64.35 ±0.06
	PEG400	39.38 ±0.01	62.38 ±0.09	60.43 ±0.09	70.67 ± 0.04	64.70 ±0.08	67.14 ±0.05	59.72 ±0.03	64.11 ±0.11	61.62 ±0.05

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S16

Extraction efficiencies of nine model compounds by PEG(0.20, *w*/*w*)-K_2HPO_4 ATPE.

w_{salt}	$w_{PEG=0.20}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	82.13 ± 0.01	75.23 ± 0.05	69.35 ± 0.11	81.67 ± 0.02	70.92 ±0.04	84.8 ±0.02	68.16 ±0.07	80.25 ±0.05	83.29 ±0.03
	PEG2000	60.57 ±0.08	73.24 ± 0.11	66.30 ± 0.13	74.89 ± 0.08	70.14 ±0.02	79.51 ±0.09	64.82 ±0.07	78.00 ±0.14	80.67 ±0.11
	PEG1000	69.55 ± 0.01	70.89 ±0.15	64.46 ± 0.04	71.23 ± 0.08	70.03 ±0.07	66.25 ±0.13	62.59 ±0.07	76.21 ±0.03	71.45 ±0.07
	PEG400	39.78 ±0.11	62.12 ± 0.11	61.18 ± 0.13	67.49 ± 0.14	65.65 ±0.05	72.44 ±0.05	57.94 ±0.13	74.76 ±0.02	67.34 ±0.08
0.19	PEG4000	78.33 ± 0.06	72.39 ± 0.04	78.50 ±0.11	79.53 ±0.08	74.78 ±0.08	87.60 ±0.05	69.89 ±0.07	78.62 ±0.03	78.23 ±0.12
	PEG2000	57.75 ±0.13	72.18 ±0.18	73.04 ±0.11	77.57 ± 0.01	70.25 ±0.11	74.20 ±0.08	63.21 ±0.02	77.94 ±0.08	76.35 ±0.05
	PEG1000	60.9 ±0.09	69.18 ±0.02	70.23 ± 0.04	75.03 ± 0.07	69.49 ±0.05	81.27 ±0.03	61.29 ±0.11	73.29 ±0.12	74.39 ±0.09
	PEG400	47.10 ± 0.06	67.76 ± 0.11	69.05 ±0.05	73.10 ±0.02	60.35 ±0.03	61.54 ±0.01	60.40 ±0.02	70.67 ±0.06	71.20 ±0.09
0.20	PEG4000	79.10 ±0.09	72.25 ±0.02	66.79 ± 0.13	79.35 ± 0.01	72.81 ±0.07	72.88 ±0.11	71.67 ±0.03	78.21 ±0.10	79.23 ±0.03
	PEG2000	57.05 ±0.07	70.28 ± 0.04	63.29 ± 0.07	77.61 ±0.02	70.49 ±0.11	68.90 ±0.03	64.32 ±0.03	76.33 ±0.02	79.94 ±0.12
	PEG1000	58.04 ± 0.06	63.29 ±0.07	63.18 ±0.02	75.88 ± 0.13	64.87 ± 0.04	64.78 ±0.14	63.46 ±0.05	74.26 ±0.01	71.50 ±0.12
	PEG400	39.67 ±0.06	60.19 ± 0.07	61.40 ± 0.08	74.82 ±0.02	58.92 ± 0.11	68.90 ±0.02	55.82 ±0.03	71.39 ±0.01	68.46 ±0.05

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S17

Extraction efficiencies of nine model compounds by PEG (0.22, *w*/*w*)-K_2HPO_4 ATPE.

w_{salt}	$w_{PEG=0.22}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	68.25 ±0.02	67.29 ±0.03	72.80 ±0.05	78.23 ±0.02	72.88 ± 0.01	90.11 ±0.03	70.73 ±0.05	79.62 ±0.03	78.19 ±0.08
	PEG2000	68.00 ± 0.07	64.93 ±0.05	64.90 ± 0.13	73.90 ±0.01	71.65 ±0.04	79.51 ±0.09	67.6 ±0.07	77.54 ±0.02	78.01 ±0.08
	PEG1000	61.05 ± 0.08	60.04 ± 0.03	63.12 ±0.05	71.11 ±0.12	68.43 ±0.05	67.73 ±0.02	66.35 ±0.06	76.94 ±0.06	72.57 ±0.07
	PEG400	48.43 ±0.11	60.12 ± 0.03	62.83 ±0.05	66.24 ±0.08	66.92 ± 0.11	66.25 ±0.04	56.33 ±0.05	74.24 ±0.02	66.24 ±0.08
0.19	PEG4000	73.45 ±0.08	68.27 ± 0.01	73.78 ± 0.13	77.47 ±0.06	76.58 ±0.05	81.71 ±0.13	72.60 ±0.02	78.50 ±0.01	72.38 ±0.07
	PEG2000	64.67 ± 0.06	66.59 ±0.05	73.46 ±0.05	77.03 ±0.13	74.69 ± 0.03	70.82 ±0.04	62.59 ± 0.14	77.43 ±0.03	70.34 ±0.08
	PEG1000	54.78 ±0.08	65.40 ± 0.02	69.88 ±0.15	73.55 ±0.11	72.54 ± 0.01	77.73 ±0.05	63.55 ±0.04	74.69 ±0.07	71.02 ±0.05
	PEG400	47.78 ± 0.06	63.13 ±0.05	67.09 ± 0.13	70.23 ±0.05	70.93 ± 0.07	79.51 ±0.05	55.47 ± 0.03	70.71 ±0.09	67.35 ±0.07
0.20	PEG4000	75.54 ±0.08	68.48 ±0.06	78.85 ± 0.01	75.92 ±0.02	70.84 ±0.02	84.81 ±0.05	70.26 ±0.08	68.63 ±0.05	71.23 ±0.07
	PEG2000	60.90 ± 0.06	61.21 ±0.05	67.25 ± 0.04	73.64 ±0.08	68.88 ± 0.03	74.20 ±0.04	66.57 ±0.07	66.85 ±0.05	70.27 ±0.04
	PEG1000	59.21 ±0.06	60.28 ± 0.13	65.55 ±0.05	70.31 ±0.05	70.24 ± 0.11	66.40 ±0.03	66.56 ±0.01	64.42 ±0.07	70.09 ±0.02
	PEG400	54.60 ±0.09	55.39 ±0.15	62.04 ±0.01	67.19 ±0.02	67.36 ± 0.01	74.65 ±0.05	54.94 ± 0.04	61.03 ±0.05	65.23 ±0.03

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S18

Extraction efficiencies of nine model compounds by PEG (0.18, *w*/*w*)-$K_3C_6H_5O_7$ ATPE.

w_{salt}	$w_{PEG=0.18}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	73.15 ±0.05	70.93 ±0.05	70.67 ±0.08	73.28 ±0.04	65.49 ±0.02	77.50 ±0.03	67.09 ±0.08	75.32 ±0.11	70.49 ±0.15
	PEG2000	70.11 ±0.06	66.45 ±0.05	66.05 ± 0.01	70.26 ±0.07	63.18 ±0.08	64.58 ±0.05	67.36 ± 0.04	71.66 ± 0.07	61.28 ±0.13
	PEG1000	59.33 ±0.05	61.65 ±0.03	58.23 ±0.08	66.98 ±0.04	62.39 ±0.09	76.27 ± 0.06	64.32 ±0.08	67.39 ±0.02	55.87 ±0.11
	PEG400	47.60 ±0.02	63.25 ±0.07	57.34 ± 0.13	61.02 ±0.08	58.23 ±0.03	63.60 ± 0.02	50.86 ± 0.11	64.24 ±0.08	53.41 ±0.05
0.19	PEG4000	65.80 ±0.02	70.56 ±0.05	71.33 ± 0.01	74.35 ±0.09	64.27 ±0.03	64.05 ±0.08	66.43 ±0.02	76.80 ± 0.04	65.29 ±0.07
	PEG2000	56.35 ±0.04	66.56 ±0.03	69.73 ± 0.05	72.54 ±0.09	58.64 ±0.02	63.90 ±0.08	64.10 ± 0.04	73.53 ±0.07	61.20 ±0.02
	PEG1000	56.00 ±0.02	60.79 ±0.09	58.28 ±0.02	68.90 ±0.04	57.05 ±0.06	50.06 ±0.11	65.33 ±0.12	70.75 ±0.08	60.38 ±0.06
	PEG400	41.71 ±0.03	58.45 ±0.01	56.38 ± 0.01	63.22 ±0.06	55.82 ±0.14	70.82 ±0.07	54.24 ±0.02	67.61 ±0.13	57.24 ±0.08
0.20	PEG4000	69.30 ±0.06	67.56 ±0.11	71.37 ±0.15	76.56 ±0.08	68.38 ±0.12	70.67 ±0.07	63.10 ±0.02	76.98 ±0.09	67.02 ±0.04
	PEG2000	50.70 ±0.09	66.35 ±0.04	66.50 ±0.07	71.87 ±0.08	67.29 ±0.03	63.16 ±0.08	64.82 ±0.04	70.80 ± 0.03	65.37 ±0.09
	PEG1000	46.67 ±0.01	64.35 ±0.07	61.33 ± 0.13	70.35 ±0.08	65.58 ±0.06	63.90 ±0.08	64.31 ±0.05	66.42 ±0.05	62.36 ± 0.04
	PEG400	50.10 ±0.08	64.46 ±0.04	60.88 ± 0.05	61.30 ±0.07	62.16 ±0.11	70.82 ±0.02	51.70 ± 0.04	63.79 ±0.08	60.91 ±0.09

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S19

Extraction efficiencies of nine model compounds by PEG (0.20, *w*/*w*)-$K_3C_6H_5O_7$ ATPE.

w_{salt}	$w_{PEG=0.20}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	76.28 ±0.02	71.24 ±0.01	70.25 ±0.03	79.45 ± 0.05	70.26 ±0.04	87.60 ±0.02	72.18 ±0.03	77.85 ±0.06	80.38 ±0.13
	PEG2000	52.25 ±0.05	67.23 ± 0.01	64.45 ± 0.12	77.81 ±0.03	68.27 ± 0.14	84.81 ±0.03	61.93 ±0.08	75.37 ±0.06	77.49 ±0.11
	PEG1000	56.73 ±0.08	63.45 ±0.16	61.77 ±0.02	70.32 ± 0.08	67.36 ± 0.02	70.82 ±0.06	62.28 ± 0.05	74.24 ± 0.05	70.37 ±0.03
	PEG400	44.67 ±0.03	63.32 ± 0.04	61.09 ± 0.02	69.03 ± 0.04	65.78 ± 0.05	59.92 ± 0.05	50.97 ±0.03	71.90 ±0.08	66.26 ±0.02
0.19	PEG4000	80.88 ±0.07	71.45 ±0.02	69.85 ±0.06	77.58 ± 0.06	73.21 ±0.03	72.88 ±0.15	69.30 ±0.07	72.44 ±0.02	74.58 ±0.09
	PEG2000	57.90 ±0.14	67.39 ±0.08	68.07 ± 0.01	75.94 ± 0.03	70.03 ±0.01	70.08 ±0.09	62.85 ±0.08	71.25 ±0.02	70.41 ±0.07
	PEG1000	52.00 ±0.04	61.29 ± 0.13	67.78 ±0.07	73.07 ±0.08	67.31 ± 0.02	72.73 ±0.11	66.09 ±0.04	71.04 ±0.02	65.25 ±0.06
	PEG400	60.67 ±0.03	59.38 ±0.09	65.98 ± 0.05	70.83 ± 0.01	58.32 ±0.03	67.14 ±0.08	52.55 ±0.03	68.97 ±0.13	64.14 ±0.07
0.20	PEG4000	65.17 ±0.09	68.39 ±0.03	68.33 ± 0.04	77.36 ± 0.11	70.44 ±0.04	87.46 ±0.06	71.22 ±0.02	71.35 ±0.05	72.12 ±0.06
	PEG2000	59.70 ± 0.14	67.46 ± 0.02	60.92 ±0.13	76.94 ±0.11	68.25 ± 0.06	56.68 ±0.07	57.33 ±0.03	70.43 ±0.04	70.39 ±0.09
	PEG1000	53.53 ± 0.01	63.48 ± 0.13	59.68 ± 0.08	74.25 ± 0.07	63.27 ±0.03	63.60 ±0.07	51.26 ±0.02	67.66 ±0.03	67.46 ±0.08
	PEG400	50.35 ±0.03	65.03 ± 0.01	58.67 ± 0.05	72.10 ± 0.11	60.94 ±0.03	68.90 ± 0.02	49.36 ±0.03	65.28 ±0.07	65.45 ±0.02

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S20

Extraction efficiencies of nine model compounds by PEG (0.22, *w*/*w*)-$K_3C_6H_5O_7$ ATPE.

w_{salt}	$w_{PEG=0.22}$	E(%)[a] HRP	E(%)[a] BSA	E(%)[a] CYT	E(%)[a] ANT	E(%)[a] CAR	E(%)[a] CHL	E(%)[b] ASP	E(%)[b] FRU	E(%)[b] PUP
0.18	PEG4000	73.13 ±0.06	70.27 ±0.08	72.00 ±0.07	73.26 ±0.02	70.23 ± 0.01	76.27 ±0.05	61.83 ±0.11	78.82 ±0.03	70.27 ±0.07
	PEG2000	60.90 ± 0.13	65.31 ±0.04	68.83 ± 0.13	70.39 ±0.07	69.34 ±0.05	79.51 ±0.02	56.70 ±0.03	76.64 ±0.06	69.58 ±0.06
	PEG1000	56.73 ±0.08	62.38 ±0.02	62.40 ± 0.04	63.04 ±0.01	67.88 ± 0.13	64.78 ±0.07	60.23 ±0.03	74.37 ±0.11	67.09 ±0.05
	PEG400	56.26 ±0.12	60.46 ±0.11	60.25 ± 0.08	60.25 ±0.01	65.24 ±0.11	65.37 ±0.05	46.11 ±0.01	70.02 ±0.09	63.26 ± 0.06
0.19	PEG4000	80.40 ±0.05	70.57 ±0.12	69.63 ±0.03	71.78 ±0.08	73.97 ± 0.06	82.45 ±0.11	65.82 ±0.03	69.25 ±0.02	70.32 ±0.12
	PEG2000	60.87 ± 0.10	64.17 ±0.13	69.28 ±0.05	70.07 ±0.01	72.15 ± 0.14	63.60 ±0.05	59.34 ±0.12	67.93 ±0.13	68.21 ± 0.06
	PEG1000	57.56 ±0.13	60.22 ±0.05	67.45 ±0.05	68.45 ±0.09	71.46 ± 0.03	83.92 ±0.11	41.01 ±0.14	67.34 ±0.12	66.45 ±0.09
	PEG400	51.59 ±0.11	57.59 ±0.11	64.73 ± 0.08	64.80 ±0.04	69.20 ± 0.03	58.30 ±0.04	55.92 ±0.01	65.25 ±0.05	62.78 ±0.09
0.20	PEG4000	78.58 ± 0.05	66.34 ±0.03	69.25 ± 0.03	72.15 ±0.01	68.25 ± 0.07	77.74 ±0.11	68.37 ±0.02	70.37 ±0.04	70.67 ±0.08
	PEG2000	61.60 ± 0.13	65.31 ±0.03	65.06 ±0.12	71.23 ±0.04	66.46 ± 0.13	79.50 ±0.08	60.64 ±0.12	66.26 ±0.08	68.42 ±0.03
	PEG1000	59.50 ± 0.11	62.30 ±0.05	61.80 ± 0.01	67.31 ±0.04	65.98 ± 0.07	72.73 ±0.14	59.17 ±0.11	64.31 ±0.03	67.23 ±0.09
	PEG400	52.67 ± 0.03	61.23 ±0.01	60.94 ± 0.08	65.85 ±0.02	63.12 ±0.09	61.83 ± 0.13	52.57 ±0.11	60.29 ±0.11	64.56 ± 0.02

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S21

Extraction efficiencies of nine model compounds by PEG4000-$(NH_4)_2SO_4$ ATPE.

w_{PEG}	w_{salt}	E (%)[a] HRP	E (%)[a] BSA	E (%)[a] CYT	E (%)[a] ANT	E (%)[a] CAR	E (%)[a] CHL	E (%)[b] ASP	E (%)[b] FRU	E (%)[b] PUP
0.18	0.18	81.68 ± 0.03	75.05 ± 0.06	72.60 ± 0.09	85.74 ± 0.09	73.32 ± 0.06	94.06 ± 0.10	82.61 ± 0.01	85.17 ± 0.11	84.04 ± 0.08
	0.19	79.05 ± 0.11	74.93 ± 0.01	74.14 ± 0.07	82.49 ± 0.05	67.85 ± 0.08	93.70 ± 0.12	83.72 ± 0.05	84.83 ± 0.10	85.95 ± 0.05
	0.20	77.27 ± 0.09	82.77 ± 0.06	71.57 ± 0.07	85.06 ± 0.05	78.65 ± 0.10	92.74 ± 0.08	81.19 ± 0.07	87.05 ± 0.13	84.83 ± 0.01
0.20	0.18	85.41 ± 0.11	86.35 ± 0.08	82.94 ± 0.05	85.92 ± 0.11	82.22 ± 0.04	96.60 ± 0.06	84.03 ± 0.06	87.74 ± 0.10	86.65 ± 0.04
	0.19	82.45 ± 0.06	84.25 ± 0.03	82.65 ± 0.08	86.67 ± 0.08	86.37 ± 0.01	93.69 ± 0.06	86.02 ± 0.04	87.82 ± 0.05	86.77 ± 0.07
	0.20	81.08 ± 0.05	82.96 ± 0.05	82.20 ± 0.11	86.74 ± 0.07	82.5 ± 0.10	91.23 ± 0.09	85.65 ± 0.13	89.42 ± 0.12	87.74 ± 0.09
0.22	0.18	84.79 ± 0.12	88.87 ± 0.06	83.25 ± 0.05	84.67 ± 0.11	82.22 ± 0.14	93.37 ± 0.10	80.80 ± 0.04	87.21 ± 0.05	83.39 ± 0.08
	0.19	82.50 ± 0.05	89.24 ± 0.12	83.60 ± 0.12	83.11 ± 0.06	84.10 ± 0.04	91.23 ± 0.06	83.39 ± 0.12	87.02 ± 0.12	84.03 ± 0.09
	0.20	81.60 ± 0.12	82.53 ± 0.12	77.58 ± 0.08	83.65 ± 0.12	77.77 ± 0.08	94.06 ± 0.09	81.76 ± 0.01	86.02 ± 0.05	83.03 ± 0.12

[a] extraction efficiency of target in PEG-rich phase; [b] extraction efficiency of target in salt-rich phase.

Table S22

The partition coefficients (K) and extraction efficiencies (E) of nine model compounds by the integrated method.

		HRP	BSA	CYT	ANT	CAR	CHL	ASP	FRU	PUP
PEG4000-$(NH_4)_2SO_4$ ATPS	K	2.840[a] ± 0.03	2.851[a] ± 0.04	2.823[a] ± 0.02	2.836[a] ± 0.02	2.810[a] ± 0.04	3.127[a] ± 0.01	0.367[b] ± 0.01	0.368[b] ± 0.02	0.361[b] ± 0.04
	E (%)	85.41[a] ± 0.11	86.35[a] ± 0.08	82.94[a] ± 0.05	85.92[a] ± 0.11	82.22[a] ± 0.04	96.60[a] ± 0.06	84.03[b] ± 0.06	87.74[b] ± 0.10	86.65[b] ± 0.04
Electrolyte regulation	K	0.352[c] ± 0.02	0.353[c] ± 0.01	0.351[c] ± 0.01	3.125[d] ± 0.03	2.807[d] ± 0.04	2.825[d] ± 0.02	/	/	/
	E (%)	84.39[c] ± 0.04	80.31[c] ± 0.02	82.37[c] ± 0.04	93.28[d] ± 0.01	80.34[d] ± 0.02	84.30[d] ± 0.04	/	/	/
Copolymer purification	K	0.350[e] ± 0.02	2.806[f] ± 0.02	2.812[f] ± 0.03	/	/	/	/	/	/
	E (%)	84.26[e] ± 0.02	80.19[f] ± 0.01	81.35[f] ± 0.02	/	/	/	/	/	/

[a] Extraction efficiency and distribution coefficient of target in PEG-rich phase of PEG4000-$(NH_4)_2SO_4$ ATPS;

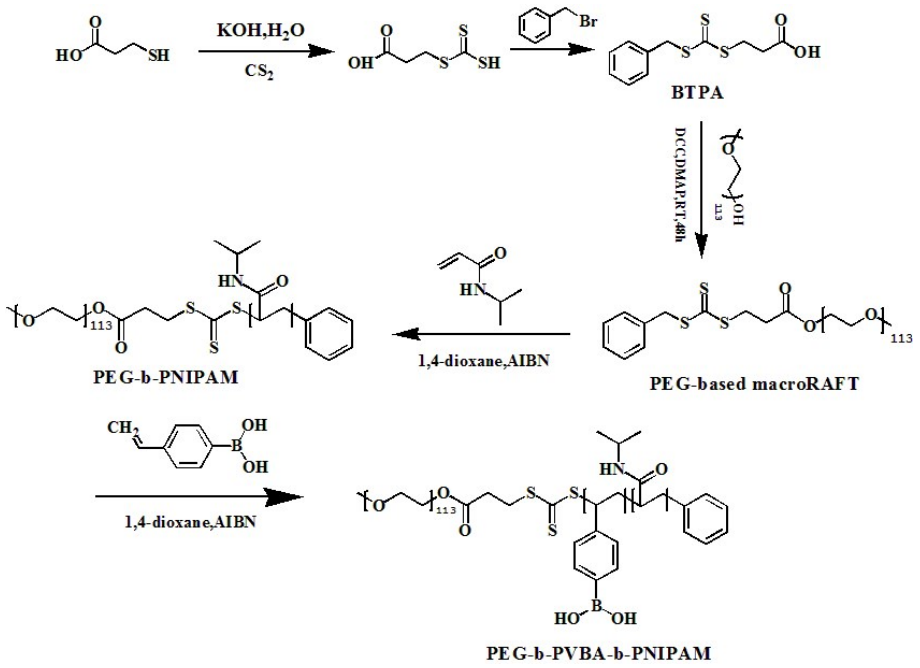
[b] Extraction efficiency and distribution coefficient of target in salt-rich phase of PEG4000-$(NH_4)_2SO_4$ ATPS;

[c] Extraction efficiency and distribution coefficient of target in salt-rich phase of PEG4000-$Na_3C_6H_5O_7$ ATPS;

[d] Extraction efficiency and distribution coefficient of target in PEG-rich phase of PEG4000-$Na_3C_6H_5O_7$ ATPS;

[e] Extraction efficiency and distribution coefficient of target in the coacervate phase of temperature-controlled affinity precipitation;

[f] Extraction efficiency and distribution coefficient of target in the dilute phase of the temperature-controlled affinity precipitation;



Scheme S1. Schematic illustration for the synthesis of PEG_{113}-b-$PVBA_{49}$-b-$PNIPAM_{105}$

Synthesis of Benzyl trithiocarbonate (BTPA)

First, CS_2 (3.65 mL) was slowly dropped into the mixture solution contained 3-mercaptopropionic acid (MPA, 5.00 mL, 28.65 mmol) and KOH (1.84 mol/L, 65.00 mL), and then the mixture reacted in a round bottom for 5 h at room temperature. Subsequently, the reactants were heated to 85 ^{o}C and turned on the condenser pipe reflux for 12 h after adding benadryl bromide (10 g, 28.65 mmol) drop by drop within 1 h. After the reaction, chloroform (80 mL) was added to dilute the solution, and then a large amount of concentrated hydrochloric acid was added into the reaction solution to wash until the upper phase was clear and transparent. Finally, the lower phase was condensed into an orange oily liquid by rotary evaporator and washed with deionized water to obtain the yellow powder sample. ^{1}HNMR ($CDCl_3$, δ, ppm: 7.33 (5H, ArH), 4.64 (2H, $ArCH_2$−), 3.65 (2H, $-CH_2COOH$), 2.87(2H, $-C(=S)SCH_2$).

Synthesis of PEG-based MacroRAFT agent

First, PEG (10.00 g, 2.00 mmol) and BTPA (1.60 g, 4.00 mmol) were dissolved in dichloromethane (50.00 mL). Then, 20 mL dichloromethane contained a catalyst (DMAP，100 mg，0.8 mmol) and a dehydrating agent (DCC，2.00 g，9.70 mmol) was slowly dropped into the mixture solution and reacted at room temperature for 48 h. When the reaction was over, excess ether was added to the filtrated liquid to precipitate the product. Finally, the product was dried in a vacuum dryer to obtain a yellowish powdery macromolecular chain transfer agent. ^{1}H NMR

($CDCl_3$, δ, ppm: 7.29 (5H, ArH), 4.62 (2H, $ArCH_2-$), 4.27 (2H, $-CH_2OCOCH_2-$), 3.65 (452H, $-CH_2CH_2O-$), 3.39 (3H, CH_3O-), 2.82 (2H, $-CH_2OCOCH_2CH_2SC-(=S)-$).

Synthesis of PEG-b-PNIPAM

NIPAM (0.91 g, 8.00 mmol), PEG macromolecular chain transfer agent (0.28 g, 0.05 mmol), AIBN (2.00 mg, 12.00 mol) and 1, 4-dioxane (2.00 g) were injected into a round bottom flask with a magnetic agitation stick. Then, the mixture was reacted at nitrogen for 1.5 h at 75℃. After the reaction, the impurities were removed three times with excessive ethyl ether, and the light yellow powder was obtained after vacuum drying.

Synthesis of thermo-responsive triblock copolymer PEG_{113}-b-$PVBA_{49}$-b-$PNIPAM_{105}$

PEG-b-PNIPAM (1.20 g), AIBN (2.00 mg, 12.00 mol), 1, 4-dioxane (2 mL) and 4-vinyl benzene boric acid (0.14 g, 1.16 mmol) were placed in a dry round bottom flask with a magnetic stirring rod under nitrogen protection. Then, the mixed solution was reacted at 70℃ for 20 h. After the reaction, the final polymer PEG_{113}-b-$PVBA_{49}$-b-$PNIPAM_{105}$ was obtained in the form of white powder.

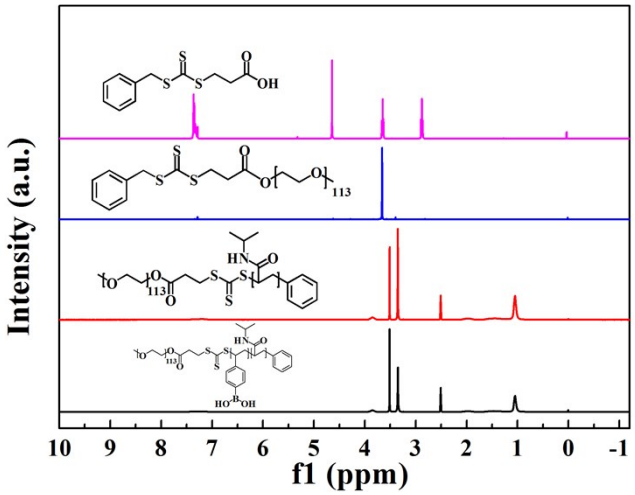


Fig. S1. ^1H NMR spectra. (a) BTPA, (b) PEG_{113}-based macroRAFT agent, (c) PEG_{113}-b-$PNIPAM_{105}$, (d) PEG_{113}-b-$PVBA_{49}$-b- $PNIPAM_{105}$.

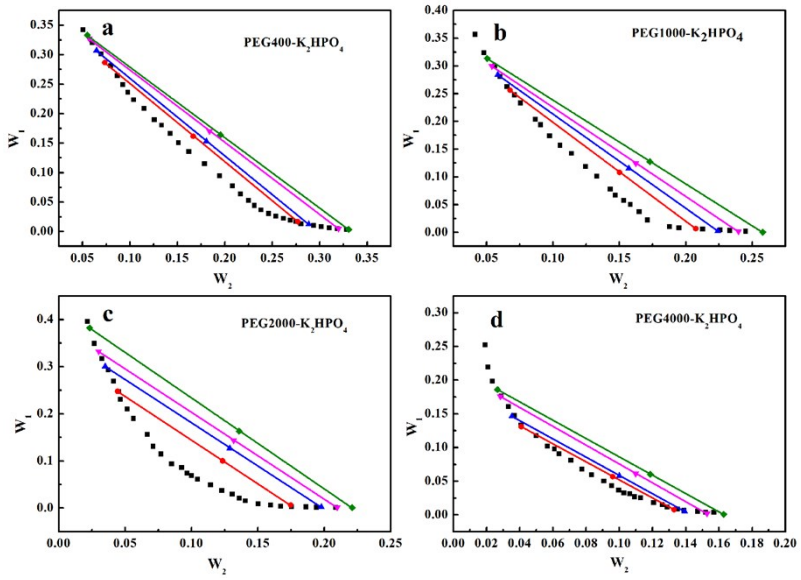


Figure S2. Liquid-liquid equilibrium of PEG-K_2HPO_4 ATPSs at 298.15 K and 101.325 kPa.

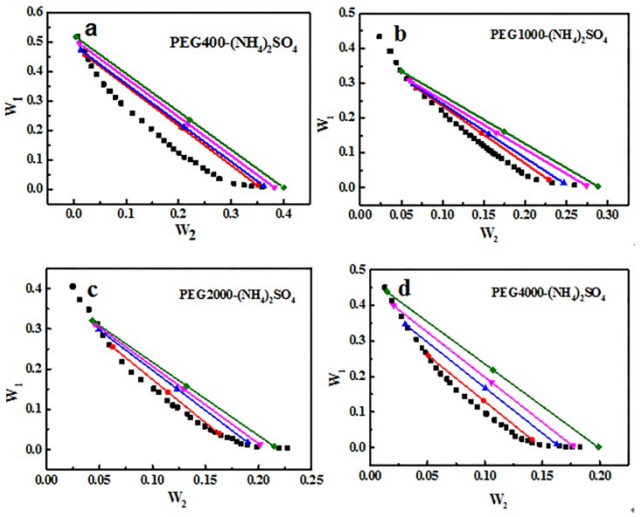


Figure S3. Liquid-liquid equilibrium of PEG-$(NH_4)_2SO_4$ ATPSs at 298.15 K and 101.325 kPa.

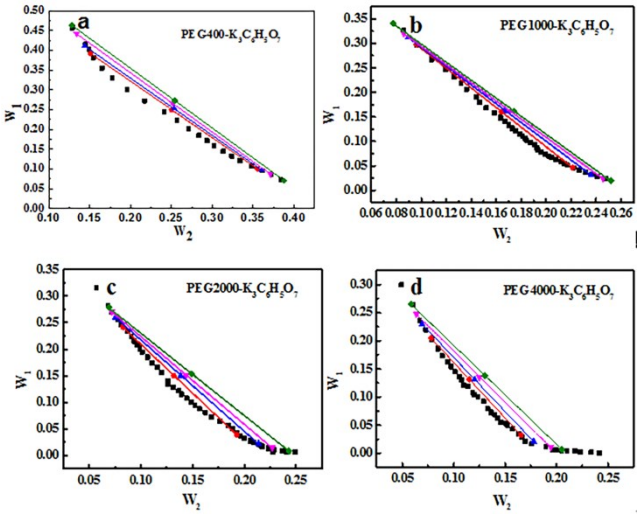


Figure S4. Liquid-liquid equilibrium of PEG-$K_3C_6H_5O_7$ ATPSs at 298.15 K and 101.325 kPa.