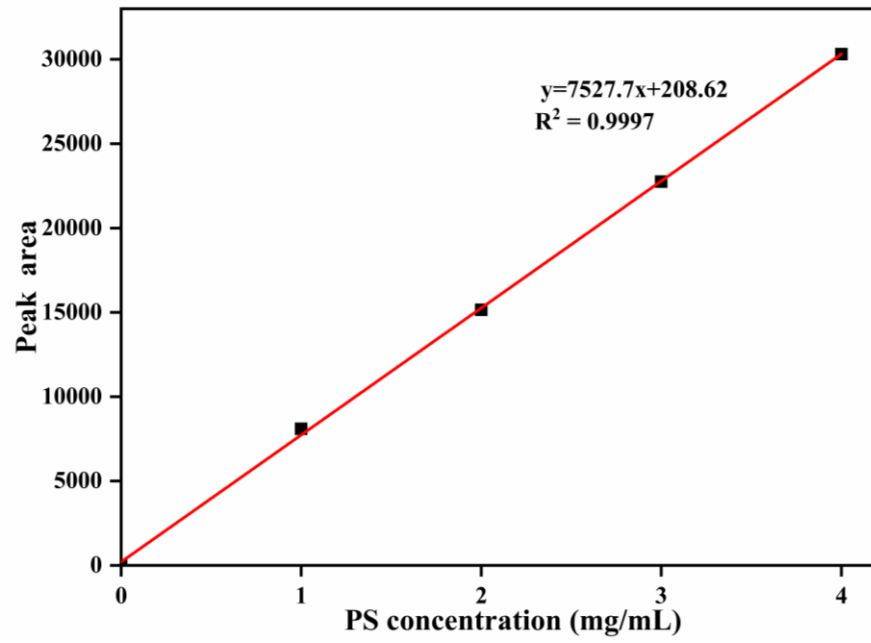


# Supporting Information

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**Figure S1.** HPLC standard curve of PS concentration .

**Table S1.** The influence of enzyme content and Ca<sup>2+</sup> concentration on the relative enzyme activity and the enzyme activity recovery rate.

Enzyme content of free saPLD (U)/Ca <sup>2+</sup> concentration (mM)	Molecular mass of PS (mg)	Enzyme content of saPLD@NFs (U)	Relative enzyme activity of saPLD@NFs (%)	The enzyme activity recovery rate of saPLD@NFs (%)
0.15/12	1.460±0.140	0.098±0.003	18.367±0.717	65.610±1.686
0.15/24	1.619±0.034	0.109±0.002	20.369±0.702	72.750±1.531
0.15/36	2.103±0.039	0.142±0.003	26.459±0.842	94.511±1.732
0.15/48	2.003±0.031	0.135±0.002	25.202±0.731	90.016±1.395
0.30/12	3.665±0.070	0.247±0.005	46.098±1.403	82.320±1.579
0.30/24	4.720±0.062	0.318±0.004	59.437±1.583	106.140±1.402
0.30/36	5.261±0.073	0.355±0.005	66.168±1.808	118.162±1.638
0.30/48	4.850±0.081	0.327±0.005	61.016±1.138	108.951±1.829
0.45/12	6.050±0.064	0.408±0.004	76.102±1.830	90.603±0.957
0.45/24	7.543±0.036	0.508±0.002	94.884±1.730	112.961±0.539
0.45/36	7.950±0.107	0.536±0.007	100.000±0.000	119.053±1.603
0.45/48	7.443±0.050	0.501±0.003	94.884±1.890	111.451±0.749
0.60/12	5.815±0.098	0.391±0.007	73.134±2.215	65.311±1.089
0.60/24	6.801±0.134	0.458±0.009	85.543±0.520	76.382±1.502
0.60/36	7.439±0.158	0.501±0.011	93.574±0.724	83.551±1.771
0.60/48	7.059±0.160	0.476±0.011	88.791±0.823	79.281±1.801
0.75/12	5.710±0.178	0.385±0.012	71.818±1.275	51.311±1.611
0.75/24	6.737±0.171	0.454±0.012	84.740±1.017	60.530±1.540
0.75/36	6.737±1.168	0.484±0.011	90.256±0.901	64.471±1.511
0.75/48	6.737±0.183	0.470±0.012	87.68±0±1.118	62.637±1.647

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. One unit of saPLD@NFs or free saPLD was defined as the amount of enzyme generating 1 µmol of PS from PC per min. The relative enzyme activity was the percentage of enzyme activity to the maximal enzyme activity, and the enzyme activity recovery rate of saPLD@NFs was designated as the observed total activity of immobilized enzymes divided by the total original activity.

**Table S2.** Influence of temperature on the activity of saPLD@NFs and free saPLD.

Temperature (°C)	Molecular mass of PS (mg)		Enzyme content of saPLD@NFs (U)		Relative enzyme activity (%)	
	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD
30	5.203±0.140	3.741±0.195	0.352±0.009	0.253±0.013	65.63±1.433	56.16±1.475
40	6.112±0.125	4.535±0.199	0.413±0.008	0.306±0.013	77.08±1.183	68.00±1.210
50	7.598±0.140	5.921±0.250	0.513±0.009	0.400±0.017	95.83±1.283	88.90±1.420
60	7.929±0.040	6.660±0.178	0.536±0.004	0.450±0.012	100.00±0.000	100.00±0.000
70	6.194±0.145	2.711±0.152	0.419±0.010	0.183±0.010	78.13±1.435	40.60±1.223
80	4.955±0.146	1.938±0.124	0.335±0.011	0.131±0.008	62.50±1.520	29.10±1.113

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. Then the enzyme activities of free and saPLD@NFs were calculated based on the definition of enzyme activity. The relative enzyme activity was the percentage of enzyme activity to the maximal enzyme activity.

**Table S3.** Influence of temperature on the stability of saPLD@NFs and free saPLD.

Temperature (°C)	Molecular mass of PS (mg)		Enzyme content of saPLD@NFs (U)		Residual enzyme activity (%)	
	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD
30	8.250±0.136	6.727±0.086	0.557±0.009	0.455±0.006	104.000±1.720	101.000±1.290
40	7.845±0.098	4.834±0.100	0.530±0.007	0.327±0.007	98.899±1.229	72.587±1.497
50	4.735±0.134	0.366±0.109	0.320±0.009	0.025±0.007	59.684±1.694	5.500±1.630
60	2.502±0.103	0.087±0.081	0.169±0.007	0.006±0.005	31.542±1.302	1.300±1.210

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. Then the enzyme activities of free and saPLD@NFs were calculated based on the definition of enzyme activity. The residual enzyme activity was designated the viability of the untreated enzyme as 100%.

**Table S4.** Influence of pH on the activity of saPLD@NFs and free saPLD..

pH	Molecular mass of PS (mg)		Enzyme content of saPLD@NFs (U)		Relative enzyme activity (%)	
	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD
5.0	7.539±0.183	5.135±0.208	0.509±0.012	0.347±0.014	95.036±1.416	77.112±1.442
6.0	7.933±0.074	6.660±0.148	0.536±0.005	0.450±0.010	100.000±0.000	100.000±0.000
7.0	7.021±0.187	5.395±0.198	0.474±0.013	0.365±0.013	88.508±1.528	81.021±1.201
8.0	5.322±0.153	3.297±0.189	0.360±0.010	0.223±0.013	67.094±1.304	49.500±1.740
9.0	4.509±0.138	2.688±0.169	0.305±0.009	0.182±0.011	56.845±1.215	40.353±1.643

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. Then the enzyme activities of free and saPLD@NFs were calculated based on the definition of enzyme activity. The relative enzyme activity was the percentage of enzyme activity to the maximal enzyme activity.

**Table S5.** Influence of pH on the stability of saPLD@NFs and free saPLD.

pH	Molecular mass of PS (mg)		Enzyme content of saPLD@NFs (U)		Residual enzyme activity (%)	
	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD	saPLD@NFs	free saPLD
5.0	7.485±0.113	5.774±0.087	0.506±0.008	0.390±0.006	94.411±1.421	86.700±1.310
6.0	7.897±0.103	6.106±0.114	0.534±0.007	0.413±0.008	99.601±1.301	91.675±1.715
7.0	7.534±0.160	5.845±0.088	0.509±0.011	0.395±0.006	95.023±2.023	87.766±1.316
8.0	6.826±0.104	5.440±0.100	0.461±0.007	0.368±0.007	86.098±1.318	81.688±1.508

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. Then the enzyme activities of free and saPLD@NFs were calculated based on the definition of enzyme activity. The residual enzyme activity was designated the viability of the untreated enzyme as 100%.

**Table S6.** Enzymatic catalysis with different reaction times and enzyme amount.

saPLD@NFs amount (g)/Reaction time (h)	Molecular mass of PS (mg)	PS yield of saPLD@NFs (%)
0.25/1	9.335±0.768	19.124±1.579
0.25/2	14.302±0.771	29.300±1.580
0.25/3	18.624±0.841	38.153±1.723
0.25/4	19.037±0.703	39.000±1.440
0.25/5	20.784±0.780	42.579±1.599
0.50/1	19.345±0.703	39.630±1.440
0.50/2	23.284±0.727	47.700±1.490
0.50/3	28.032±0.700	57.428±1.578
0.50/4	27.872±0.903	57.100±1.850
0.50/5	27.639±0.743	56.623±1.503
0.75/1	20.480±0.682	41.957±1.397
0.75/2	23.918±0.639	49.000±1.310
0.75/3	27.912±0.762	57.183±1.543
0.75/4	28.263±0.789	57.900±1.615
0.75/5	27.847±0.717	57.050±1.470

The peak areas were utilized to calculate the PS concentrations in the samples using standard curves prepared by the PS standards of known concentration, and the molecular mass of PS could be further determined. The PS conversion rate (mol%) was exhibited as the PS yield, which was calculated by the equation: PS yield (mol%)=PS amount/initial PC amount×100%.