Supporting Information

Table S1. Dissolution kinetic parameters of pseudo-first-order dynamics model.

P (mg/L)	q_e (mg/g)	Pseudo-first-order dynamics		
		q_e (mg/g)	k_1 (1/min)	R^2
0	-39.7	-61.6	-0.00088	0.7085
1	-26.7	-41.9	-0.00084	0.6889
5	-23.5	-36.4	-0.00021	0.5695
25	-5.0	-11.1	0.00017	0.1051

Table S2. Dissolution kinetic parameters of pseudo-second-order dynamics model.

P (mg/L)	q_e (mg/g)	Pseudo-second-order dynamics		
		q_e (mg/g)	k_2 (g/(mg·min))	R^2
0	-39.7	-41.8	0.0011	0.9994
1	-26.7	-27.9	0.0018	0.9995
5	-23.5	-22.2	0.0014	0.9951
25	-5.0	-11.5	-0.0867	0.0281

Table S3. Dissolution kinetic parameters of intra-particle diffusion model.

P (mg/L)	K_{p1} (mg/(g·min$^{1/2}$))	C_1 (mg/g)	R_2	K_{p2} (mg/(g·min$^{1/2}$))	C_2 (mg/g)	R^2	K_{p3} (mg/(g·min$^{1/2}$))	C_3 (mg/g)	R_2
0	-0.1371	-1.9678	--	-0.0800	-2.5808	0.9912	0.0242	-4.3891	--
1	-0.1153	-1.1367	--	-0.0425	-1.9190	0.9683	0.0242	-3.0891	--
5	-0.1432	0.2192	--	-0.0305	-1.5138	0.9504	0.0180	-2.8328	--

Table S4. Parameters of dissolution isotherms at different temperatures.

Temperature (K)	Langmuir model			Freundlich model		
	q_m (mg/g)	K_L (L/mg)	R^2	K_F (mg/g(L/mg)$^{1/n}$)	$1/n$	R^2
283	-0.7030	-0.3666	0.8301	-8.6614	-8.08236	0.9254
293	-0.8831	-0.3539	0.7975	-9.2236	-0.7449	0.9237
303	-1.0096	-0.3564	0.8279	-9.8188	-0.7594	0.9139

Table S5. Thermodynamic parameters of HAP dissolution at different temperatures.

Temperature (K)	Ln K_0	ΔG^0 (kJ/mol)	ΔH^0 (kJ/mol)	ΔS^0 (J/(mol K))
283	0.313	-0.74	-3.93	-11.30
293	0.219	-0.53		
303	0.203	-0.51		

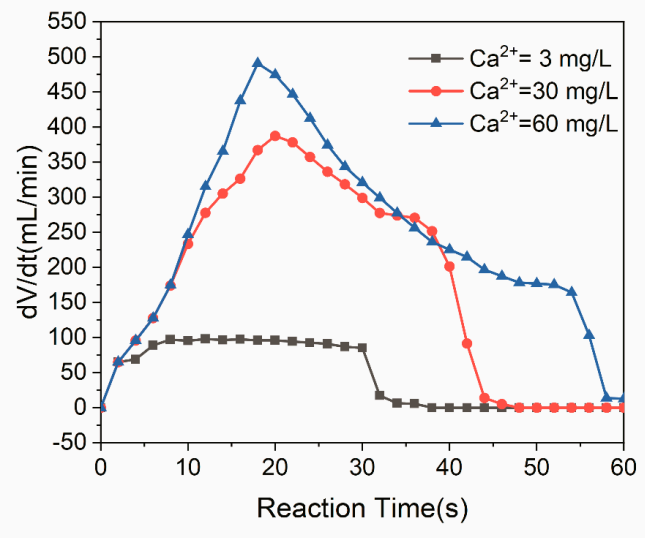

Figure S1. Effect of initial Ca concentration on alkali consumption rates during constant pH titration experiments.

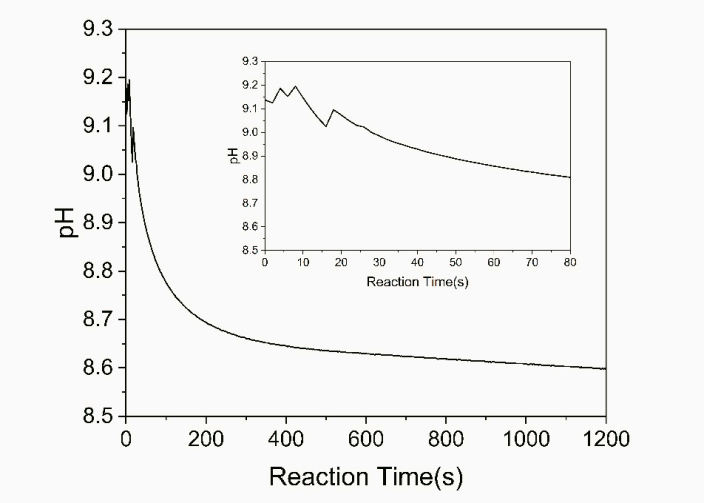

Figure S2. The change of pH during non-constant pH titration experiment.

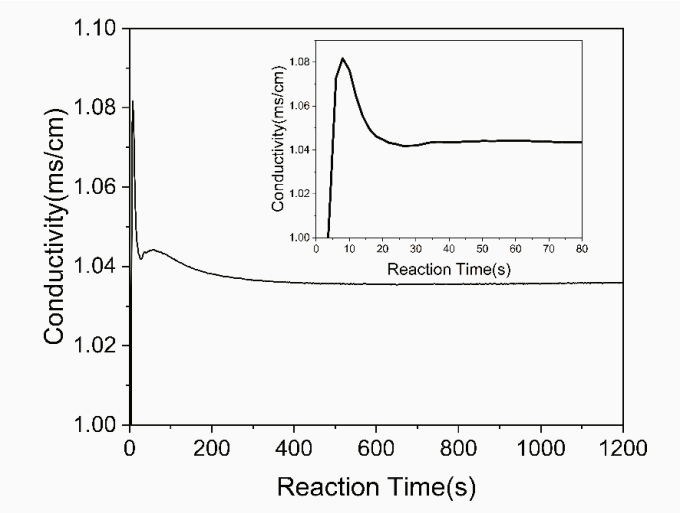

Figure S3. The change of electrical conductivity during non-constant pH titration experiment.

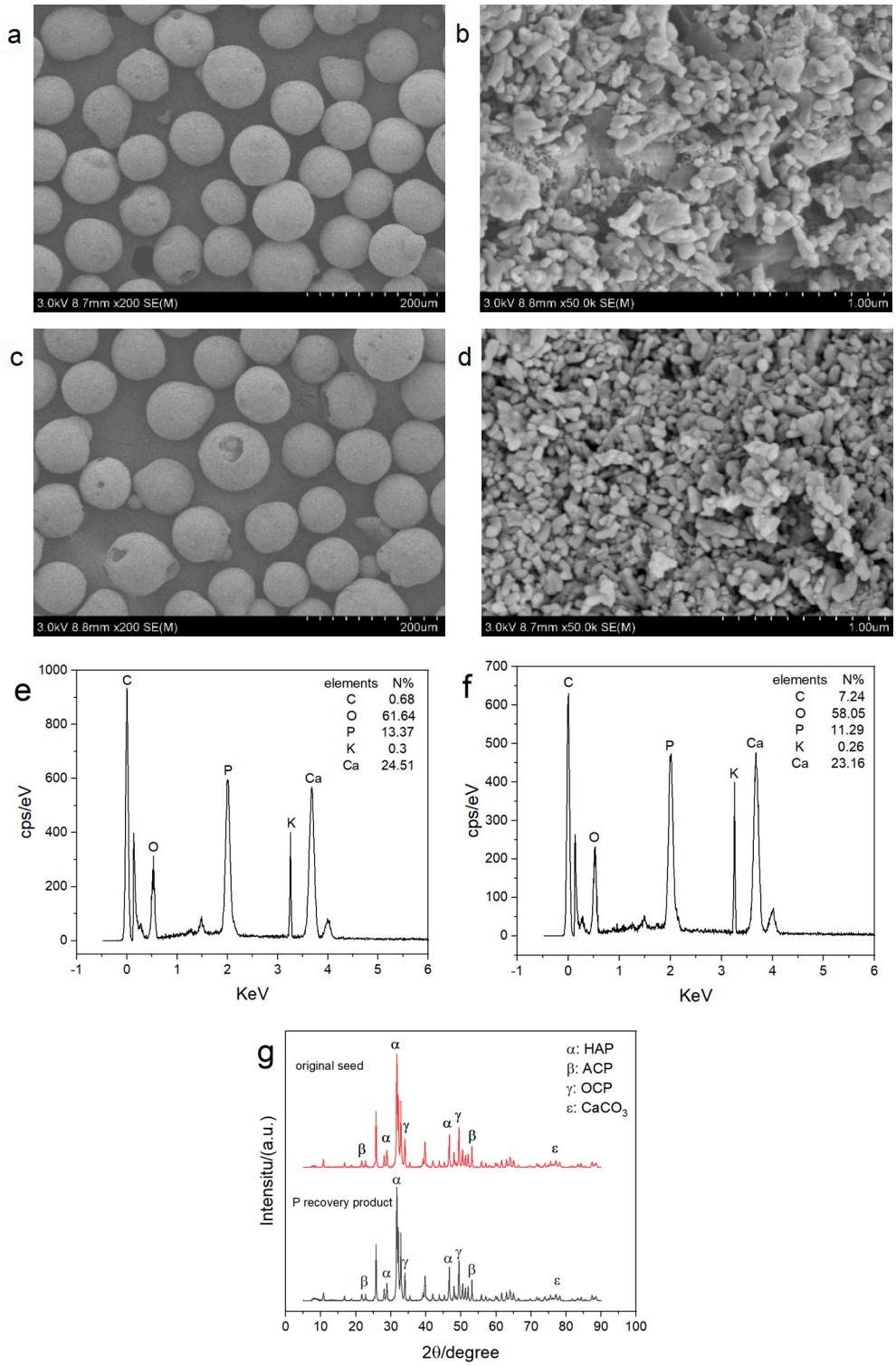

Figure S4. Characteristics of original seeds and P recovery products. (a) and (b) are SEM images of original seeds with magnification of ×200 and ×50 000, respectively. (c) and (d) are SEM images of P recovery products with magnification of × 200 and × 50 000, respectively. (e) and (f) are EDS spectra for C, O, P, K and Ca of original seeds and P recovery products, respectively. (g) is X-ray diffraction diagrams of original seeds and P recovery products. P recovery test conditions: initial P concentration of 1 mg/L, initial Ca^{2+} concentration of 30 mg/L, initial pH of 9.0, seed dosage of 2 g/L, and reaction time 30 min.