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APPENDIX

Experimental Data

A. Conditions for Batch Synthesis

Ca/ATMP Molar Ratio in Solution	Conc. of Calcium (M)	Amount of Calcium used (ml)	Conc. of ATMP (M)	Amount of ATMP used (ml)
1:1	0.5	57.7	0.6688	42.3
10:1	2.235	40	0.149	60

B. Conditions of precipitates in Micromodel Experiment

Type of precipitate	pH	Ca/phosphonate Molar Ratio in Solution	Conc. of Calcium (M)	Amount of Calcium used (ml)	Conc. of phosphonate (M)	Amount of phosphonate used (ml)
1:1 Ca-HEDP	1.5	1:1	0.1	72.9	0.2427	30
1:1 Ca-ATMP	1.5	1:1	0.5	33.44	0.1672	100
3:1 Ca-ATMP	9.0	1:1	0.5	57.7	0.6688	42.3

C. Elution curves in Micromodel Experiment

i) Elution curve of 3:1 Ca-ATMP Precipitate

Elution fluid : DI water, pH 9.0

Flowrate : 0.05 ml/min

Time (min)	PV	ATMP Conc. (ppm)
10.00	3.33	59311.93
20.00	6.67	4030.28
30.00	10.00	80.95
40.00	13.33	38.88
50.00	16.67	29.00
60.00	20.00	26.25
70.00	23.33	17.79
80.00	26.67	19.99
90.00	30.00	16.26
100.00	33.33	14.83
200.00	66.67	11.31
300.00	100.00	8.57
600.00	200.00	6.70
800.00	266.67	5.27
950.00	316.67	6.37
1200.00	400.00	6.92
1300.00	433.33	6.37
1400.00	466.67	4.91
1500.00	500.00	4.06
1700.00	566.67	13.73
1800.00	600.00	5.38
1900.00	633.33	6.59
2000.00	666.67	7.91
2050.00	683.33	7.44
2070.00	690.00	7.84

ii) Elution curves of 1:1 Ca-HEDP Precipitates

Elution fluids : DI water, 0.1 M $CaCl_2$, 0.5 M $CaCl_2$

Flowrate : 0.05 ml/min

Time (min)	PV	Type of elution fluid		
		DI H_2O	0.1 M $CaCl_2$	0.5 M $CaCl_2$
		HEDP Conc. (ppm)		
10.00	3.33	7163.75	5361.80	4850.27
20.00	6.67	1467.46	1533.82	1580.44
30.00	10.00	2019.74	880.83	538.03
40.00	13.33	2382.66	110.59	277.70
50.00	16.67	939.24	505.74	164.41
60.00	20.00	636.94	159.52	111.96
70.00	23.33	382.47	143.09	63.04
80.00	26.67	258.11	93.27	34.97
90.00	30.00	128.08	69.92	26.17
100.00	33.33	59.86	64.74	21.88
150.00	50.00	10.82	-	12.28
200.00	66.67	4.64	42.34	-
250.00	83.33	2.85	19.98	9.51
300.00	100.00	5.00	13.92	-
350.00	116.67	-	12.13	10.16
400.00	133.33	-	7.85	7.70
450.00	150.00	-	7.14	6.81
460.00	153.33	2.38	-	-
500.00	166.67	-	6.42	5.14
510.00	170.00	3.09	-	-
550.00	183.33	-	4.64	7.03
600.00	200.00	4.52	4.64	6.13
650.00	216.67	1.31	3.57	5.27
700.00	233.33	-	4.28	-
750.00	250.00	-	4.64	-
800.00	266.67	-	5.35	-
850.00	283.33	-	5.00	-

iii) Elution curves of 1:1 Ca-ATMP precipitates

Elution fluids : DI water, 0.1 M $CaCl_2$, 0.5 M $CaCl_2$

Flowrate : 0.05 ml/min

Time (min)	PV	Type of elution fluid		
		DI water	0.1 M $CaCl_2$	0.5 M $CaCl_2$
		ATMP Conc. (ppm)		
10	3.33	8466.04	3083.59	3156.02
20	6.67	2602.94	2840.99	1402.38
30	10.00	2570.34	1593.85	1335.11
40	13.33	2483.92	1588.68	1390.58
50	16.67	2398.16	1545.31	1362.83
60	20.00	2104.86	1496.13	1284.13
70	23.33	1811.56	1416.69	1256.52
80	26.67	1511.66	1342.12	1158.84
90	30.00	1367.25	1311.06	1090.61
100	33.33	1141.32	1206.70	1067.30
150	50.00	490.55	868.69	841.34
200	66.67	243.68	462.74	466.93
250	83.33	169.10	209.19	235.94
300	100.00	58.43	84.47	105.39
350	116.67	23.39	38.03	67.53
400	133.33	4.50	21.59	34.16
450	150.00	3.08	12.76	15.16
500	166.67	-	10.18	3.73
550	183.33	2.04	7.47	3.40
600	200.00	4.06	4.17	2.75
650	216.67	1.00	2.97	-
700	233.33	1.00		-
800	266.67	-	2.75	2.64
950	316.67	-	2.35	2.75
1000	333.33	-	2.35	3.08

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