

Table SI1 Orthogonal test factors and levels

	A Fast stirring speed (r/min)	B Fast stirring time (min)	C Slow stirring speed (r/min)	D Slow stirring time (min)
1	100	1.5	40	4
2	200	2	60	5
3	300	2.5	80	6

Orthogonal test results (COD removal efficiency %)

Test	A Fast stirring speed	B Fast stirring time	C Slow stirring speed	D Slow stirring time	COD removal efficiency %
1	1	1	1	1	69.9
2	1	2	2	2	62.4
3	1	3	3	3	63.3
4	2	1	2	3	68.7
5	2	2	3	1	66.2
6	2	3	1	2	67.5
7	3	1	3	2	60.3
8	3	2	1	3	53.1
9	3	3	2	1	63.9
K1	195.55	198.85	190.41	199.92	
K2	202.39	181.61	194.97	190.13	
K3	177.24	194.72	189.80	185.13	
k1	65.18	66.28	63.47	66.64	
k2	67.46	60.54	64.99	63.38	
k3	59.08	64.91	63.27	61.71	
R	8.38	5.75	1.72	4.93	

Orthogonal test results (SS removal efficiency %)

Test	A Fast stirring speed	B Fast stirring time	C Slow stirring speed	D Slow stirring time	SS removal efficiency %
1	1	1	1	1	85.22
2	1	2	2	2	99.71
3	1	3	3	3	91.35
4	2	1	2	3	87.9
5	2	2	3	1	89.93
6	2	3	1	2	81.37
7	3	1	3	2	78.51

8	3	2	1	3	73.53
9	3	3	2	1	80.23
K1	276.28	251.63	240.12	255.38	
K2	259.20	263.17	267.84	259.59	
K3	232.27	252.95	259.79	252.78	
k1	92.09	83.88	80.04	85.13	
k2	86.40	87.72	89.28	86.53	
k3	77.42	84.32	86.60	84.26	
R	14.67	3.85	9.24	2.27	

Orthogonal test results (TP removal efficiency %)

Test	A Fast stirring speed	B Fast stirring time	C Slow stirring speed	D Slow stirring time	TP removal efficiency %
1	1	1	1	1	87.62
2	1	2	2	2	82.06
3	1	3	3	3	84.42
4	2	1	2	3	87.37
5	2	2	3	1	86.83
6	2	3	1	2	85.51
7	3	1	3	2	81.25
8	3	2	1	3	80.26
9	3	3	2	1	82.90
K1	254.10	256.24	253.39	257.35	
K2	259.71	249.15	252.33	248.82	
K3	244.41	252.83	252.50	252.05	
k1	84.70	85.41	84.46	85.78	
k2	86.57	83.05	84.11	82.94	
k3	81.47	84.28	84.17	84.02	
R	5.10	2.36	0.35	2.84	

Orthogonal test results (Ammonia nitrogen removal efficiency %)

Test	A Fast stirring speed	B Fast stirring time	C Slow stirring speed	D Slow stirring time	Ammonia nitrogen removal efficiency %
1	1	1	1	1	21.35
2	1	2	2	2	20.56
3	1	3	3	3	22.36

4	2	1	2	3	18.54
5	2	2	3	1	17.62
6	2	3	1	2	19.56
7	3	1	3	2	15.24
8	3	2	1	3	13.26
9	3	3	2	1	16.52
K1	64.27	55.13	54.17	55.49	
K2	55.72	51.44	55.62	55.36	
K3	45.02	58.44	55.22	54.16	
k1	21.42	18.38	18.06	18.50	
k2	18.57	17.15	18.54	18.45	
k3	15.01	19.48	18.41	18.05	
R	6.42	2.33	0.48	0.44	

Table S12 Factor level

Level	A PAC (mg/L)	B Magnetic Particle (mg/L)	C PAM (mg/L)
-1	50	80	0.8
0	60	100	1.0
1	70	120	1.2

Test Results

No.	A PAC (mg/L)	B Magnetic Powder (mg/L)	C PAM (mg/L)	COD removal efficiency (%)	SS removal efficiency (%)	TP removal efficiency (%)	NH ₃ -N removal efficiency (%)
1	-1	-1	0	65.5	85.5	83.8	13.9
2	1	-1	0	58.9	81.9	80.2	10.3
3	-1	1	0	64.2	87.2	85.5	15.6
4	1	1	0	66.6	89.4	87.9	18.2
5	-1	0	-1	62.2	85.2	83.5	13.6
6	1	0	-1	61.7	84.7	83.0	13.4
7	-1	0	1	68.5	91.5	89.8	19.9
8	1	0	1	65.1	88.1	86.4	16.5
9	0	-1	-1	58.8	81.8	80.1	10.1
10	0	1	-1	63.5	86	84.8	14.2
11	0	-1	1	65.6	88.6	86.9	17.1
12	0	1	1	66.5	89.5	87.8	17.9
13	0	0	0	69.8	92	90.3	20.4
14	0	0	0	68.5	91.5	89.8	19.9
15	0	0	0	68.1	91.1	89.4	19.5
16	0	0	0	67.3	90.3	88.6	18.7
17	0	0	0	68.6	91.6	89.9	20.0

Variance analysis (COD removal efficiency)

Source of Variance	Sum of squares	Degree of Freedom	Mean	F-value	P value	Significance
Model	173.58	9	19.29	39.89	< 0.0001	significant
A-PAC	8.20	1	8.20	16.96	0.0045	
B-Magnetic powder	18.00	1	18.00	37.23	0.0005	
C-PAM	47.53	1	47.53	98.31	< 0.0001	
AB	20.25	1	20.25	41.88	0.0003	
AC	2.10	1	2.10	4.35	0.0755	
BC	3.61	1	3.61	7.47	0.0292	
A2	15.89	1	15.89	32.86	0.0007	

B2	31.09	1	31.09	64.31	< 0.0001	
C2	19.33	1	19.33	39.97	0.0004	
Residual	3.38	7	0.4835			
Lack of Fit	0.0925	3	0.0308	0.0375	0.9889	not significant
Pure Error	3.29	4	0.8230			
Cor Total	176.96	16				

Variance analysis (Suspended solids removal efficiency)

Source of Variance	Sum of square	Degree of Freedom	Mean	F-value	P value	Significance
Model	173.62	9	19.29	29.44	< 0.0001	significant
A-PAC	3.51	1	3.51	5.36	0.0538	
B- Magnetic powder	25.56	1	25.56	39.00	0.0004	
C-PAM	50.00	1	50.00	76.29	< 0.0001	
AB	8.41	1	8.41	12.83	0.0089	
AC	2.10	1	2.10	3.21	0.1164	
BC	2.72	1	2.72	4.15	0.0809	
A2	20.38	1	20.38	31.10	0.0008	
B2	40.46	1	40.46	61.74	0.0001	
C2	12.53	1	12.53	19.12	0.0033	
Residual	4.59	7	0.6554			
Lack of Fit	2.93	3	0.9758	2.35	0.2135	not significant
Pure Error	1.66	4	0.4150			

Variance analysis (Total phosphorous removal efficiency)

Source of Variance	Sum of square	Degree of Freedom	Mean	F-value	P value	Significance
Model	172.66	9	19.18	30.68	< 0.0001	significant
A-PAC	3.25	1	3.25	5.20	0.0566	
B-Magnetic powder	28.13	1	28.13	44.97	0.0003	
C-PAM	47.53	1	47.53	76.01	< 0.0001	
AB	9.00	1	9.00	14.39	0.0068	
AC	2.10	1	2.10	3.36	0.1094	
BC	3.61	1	3.61	5.77	0.0473	
A	21.08	1	21.08	33.71	0.0007	
B	38.21	1	38.21	61.10	0.0001	
C	11.99	1	11.99	19.17	0.0032	
Residual	4.38	7	0.6254			

Lack of Fit	2.72	3	0.9058	2.18	0.2327	not significant
Pure Error	1.66	4	0.4150			
Cor Total	177.04	16				

Variance analysis (Ammonia nitrogen $\text{NH}_3\text{-N}$ removal efficiency)

Source of Variance	Sum of square	Degree of Freedom	Mean	F-value	P value	Significance
Model	174.33	9	19.37	24.75	0.0002	significant
A-PAC	2.65	1	2.65	3.38	0.1086	
B-Magnetic powder	26.28	1	26.28	33.59	0.0007	
C-PAM	50.50	1	50.50	64.54	< 0.0001	
AB	9.61	1	9.61	12.28	0.0099	
AC	2.56	1	2.56	3.27	0.1134	
BC	2.72	1	2.72	3.48	0.1044	
A2	18.35	1	18.35	23.45	0.0019	
B2	40.79	1	40.79	52.13	0.0002	
C2	13.08	1	13.08	16.72	0.0046	
Residual	5.48	7	0.7825			
Lack of Fit	3.82	3	1.27	3.07	0.1537	not significant
Pure Error	1.66	4	0.4150			
Cor Total	179.81	16				