

Impact of nitrogen loading rate on nitrite accumulation, kinetic analysis and microbial evolution in the partial nitrification process

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Supporting information: 2 Tables and 2 Figures.

Table S1 was used to point to **Section 3.1**.

Table S2 was used to point to **Section 3.6**.

Fig. S1 was used to point to **Section 2.1**.

Fig. S2 was used to point to **Section 3.3**.

Table S1 The PN performance at different FA, FNA concentrations.

Reactor	DO (mg/L)	NH ₄ ⁺ -N (mg/L)	FA (mg/L)	FNA (mg/L)	NAR (%)	Reference
CAST ^a	0.9 - 1.1	512	16	< 0.01	95	(Wang et al., 2020)
MABR1 ^b	0.3 ± 0.1	50	< 0.2	0	15	(Li et al., 2025)
MABR2	0.1 ± 0.04	500	80	1.4	99	
CABR1 ^c	0.9 ± 0.1	50	< 0.2	0	35	
CABR2	1.0 ± 0.01	500	80	0.02	99	
	0.5 ± 0.1	400 ± 5	119.4	0.005	98.3 ± 0.9	
E-SBBR ^d	1 ± 0.1	600 ± 8	110	0.01	> 98	(Yang et al., 2025)
	1.5 ± 0.1	800 ± 10	195	0.015	> 98	
	0.1 ± 0.1	400 ± 5	< 16.0	< 0.02	0.6 ± 0.1	
SBBR ^e	2.1 ± 0.1	600 ± 8	>16.0	> 0.02	97.6 ± 0.4	
	2.5 ± 0.1	800 ± 10	>16.0	> 0.02	96.8 ± 0.6	
SBR	1.0 ± 0.01	131.25 (Phase III)	7.29	0.25	86.88	This study
	1.0 ± 0.01	48.54 (Phase V)	7.95	0	76.50	

a: continuously stirred tank reactor.

b: membrane aerated biofilm reactors.

c: conventional aerated biofilm reactors.

d: electrolysis-integrated sequencing batch biofilm reactor.

e: sequencing batch biofilm reactor.

Table S2 Summary of the PN coupling processes in low-strength wastewater treatment.

Process Type	DO (mg/L)	NH ₄ ⁺ -N _{inf} (mg/L)	NLR (kg N/(m ³ ·d))	NAR (%)	Re _{TN} (%)	Functional genus	Reference
PND	-	30	-	66.7	-	<i>Nitrosomonas</i> , <i>Nitrospiraceae mle1-7</i> , <i>OLB8</i>	(Chen et al., 2025)
PND	2.0 ± 0.5	42.7 ± 4.6	-	91.6	92.6	<i>Nitrosomonas</i> , <i>norank_f_AKYH767</i> , <i>Ferruginibacter</i>	(Li et al., 2024)
PNA	0.15	60	-	-	-	<i>Comamonas</i> , <i>Defluviimonas</i> <i>Candidatus Kuenenia</i> , <i>Sulfurimonas</i> , <i>Thiobacillus</i>	(Zhang et al., 2025)
PND	1.8 ± 0.2	110 ± 15	-	95.1	88.7	<i>Nitrosomonas</i> , <i>Ellin6067</i> , <i>OLB8</i> , <i>Candidatus_Cometibacter</i> , <i>Persicitalea</i> , <i>Thauera</i>	(Pan et al., 2025)
PNDA	-	40 - 100	0.05 - 0.08	97	-	<i>Candidatus Brocadia</i> , <i>Denitratisoma</i> , <i>Thauera</i>	(Wu et al., 2024)

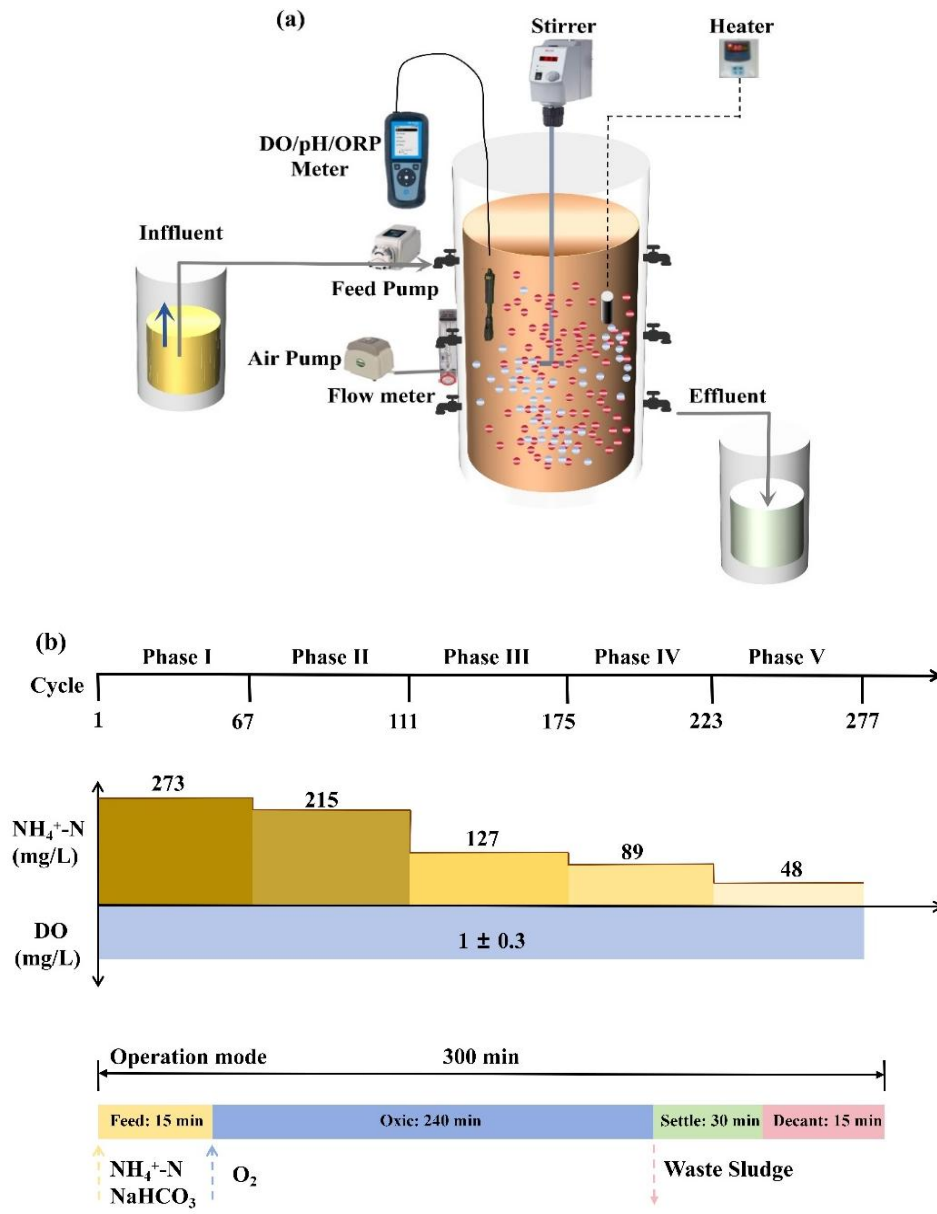


Fig. S1 Experimental diagram (a) and operating mode (b) of the PN - SBR

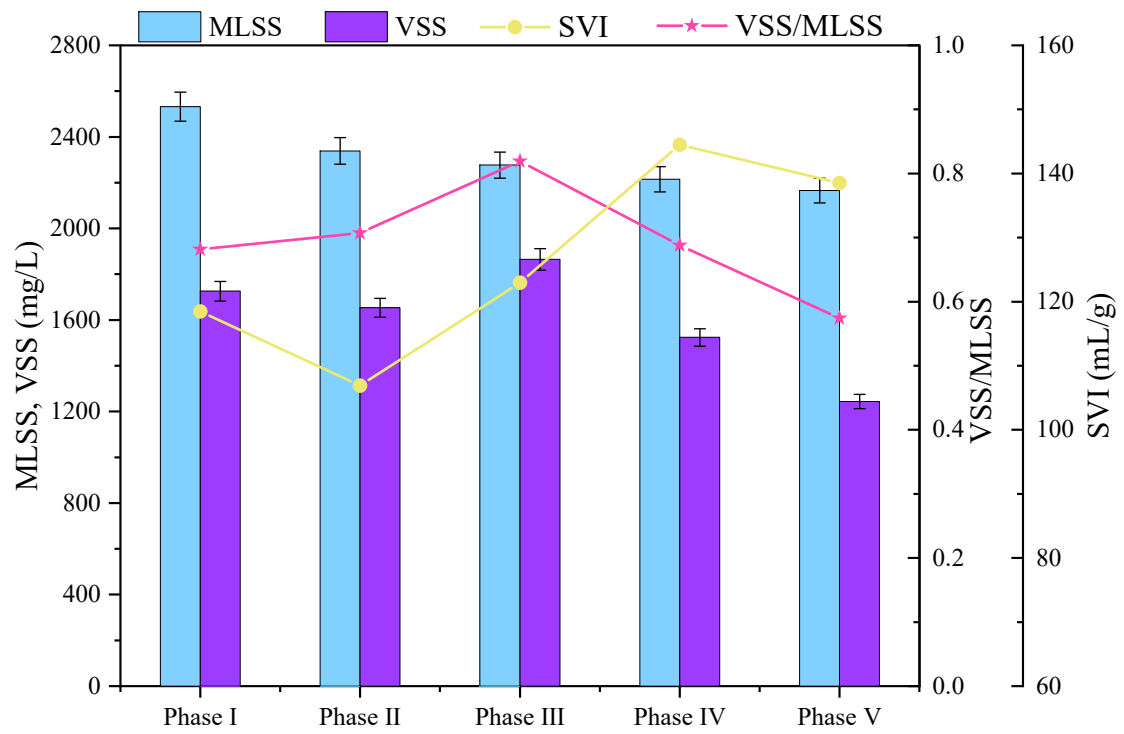


Fig. S2 Sludge characteristics linked with MLSS, VSS, VSS/MLSS and SVI

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