Supporting information

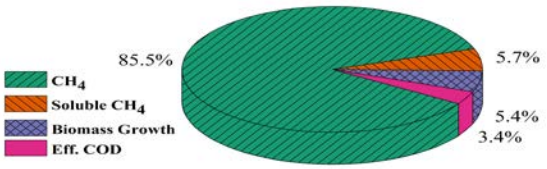

Fig. S1 COD balance in AnMBR when the HRT_{AnMBR} was 7 h.

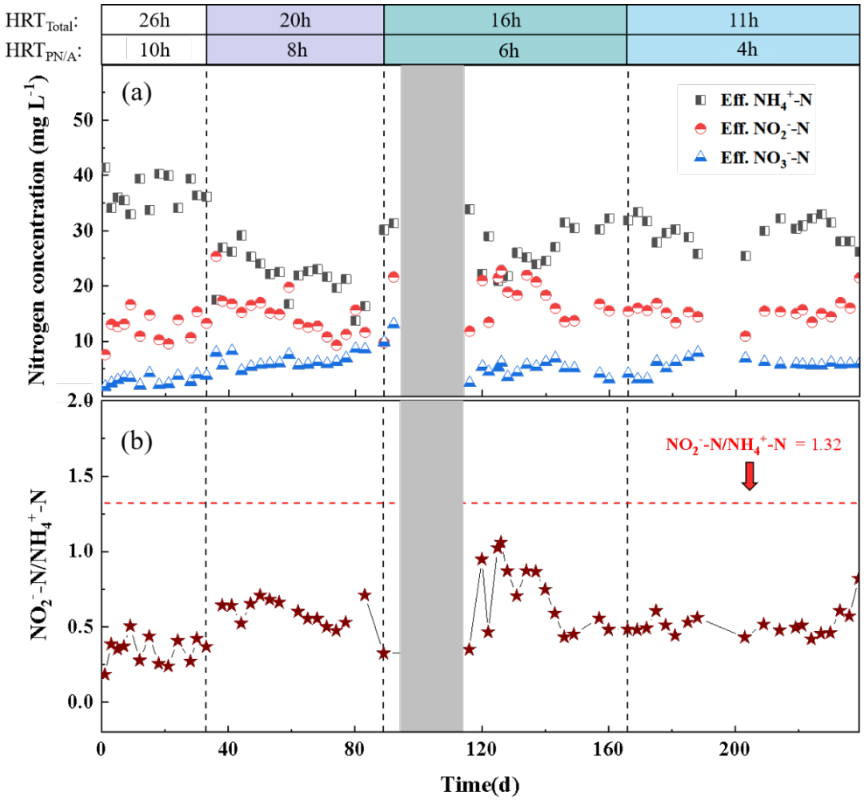

Fig. S2 Nitrogen conversion performance in PN-SBR at various HRTs: (a) nitrogen concentration and (b) NO_2^--N/NH_4^+-N ratio in the effluent.

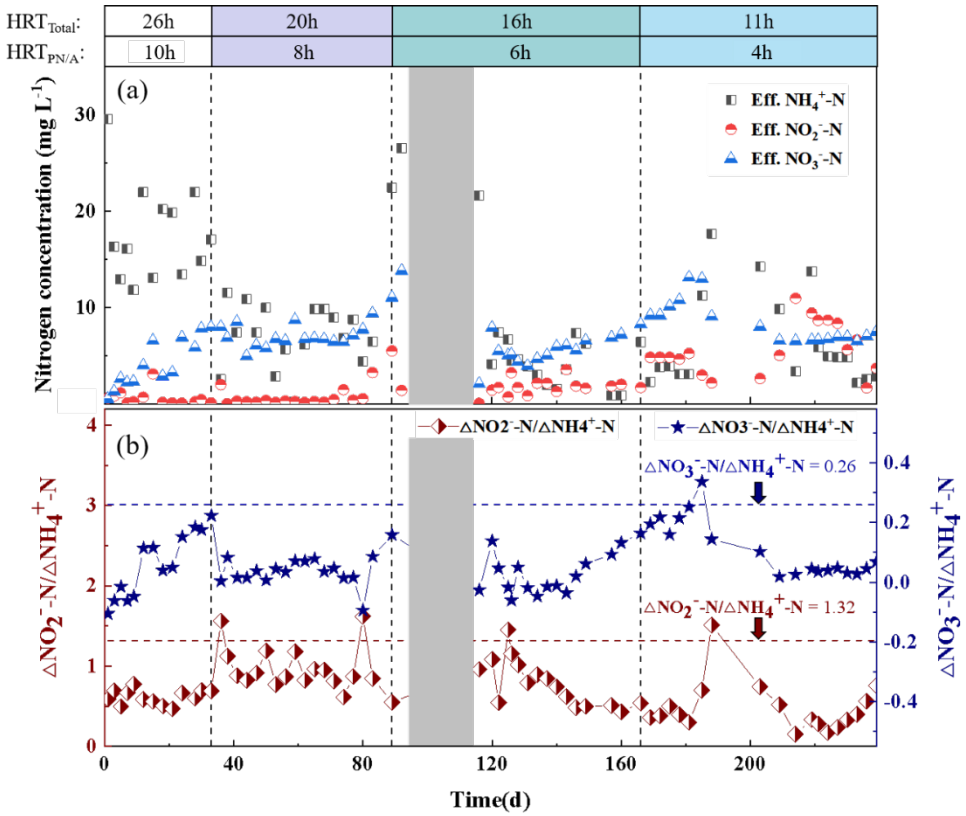

Fig. S3 Nitrogen conversion/removal performance in Anammox-UASB at various HRTs: (a) nitrogen concentration and (b) $\triangle NO_2^-$-N/$\triangle NH_4^+$-N and $\triangle NO_3^-$-N/$\triangle NH_4^+$-N.

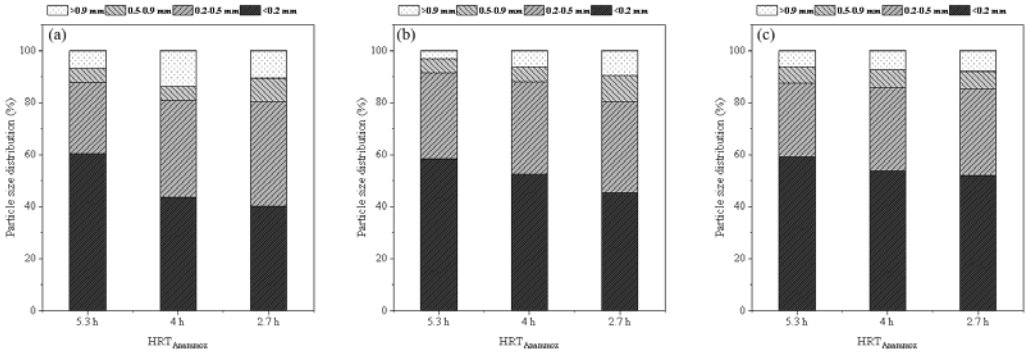

Fig. S4 The sludge particle size distribution in the (a) bottom, (b) middle and (c) top position of UASB at different HRTs.

Table S1 The substance concentration in different activity tests.

Substance type	NH_4HCO_3 (mg-N/L)	$NaNO_2$ (mg-N/L)	KNO_3 (mg-N/L)	CH_3COONa (mg/L)	KH_2PO_4 (mg/L)	$NaHCO_3$ (mg/L)	$CaCl_2{\cdot}2H_2O$ (mg/L)	$MgCl_2{\cdot}6H_2O$ (mg/L)	Trace elements solution (mL)
SAA	100	100	/	/					
SAOA	100	/	/	/					
SAOB	/	100	/	/	40	700	36	26	0.5
SDA_{NO3}	/	/	100	300					
SDA_{NO2}	/	100		300					

Table S2 Probes used for FISH identification of total bacteria, AOB, NOB and Anammox.

Target bacteria	Probe name	Specificity	Sequence (5'−3')	References	Notes
Total bacteria	EUB338	*Most bacteria*	GCTGCCTCCCGTAGGAGT	(Daims et al., 1999)	FAM
	EUB338-II	*Planctomycetales*	GCAGCCACCCGTAGGTGT		FAM
	EUB338-III	*Verrucomicrobiales*	GCTGCCACCCGTAGGTGT		FAM
	EUB338-IV	*Anammox, Isosphaera, other Planctomycetes*	GCAGCCTCCCGTAGGAGT	(Chen et al., 2019)	FAM
AOBmix	Nso190	*Beta-Proterobacterial of AOB*	CGATCCCCTGCTTTTCTCC	(Mobarry et al., 1996)	HEX
	Nso1225	*Beta-Subdivision of AOB*	CGCCATTGTATTACGTGTGA		CY3
	NEU	*Nitrosomonas spp.* *Most halophilic and halotolerant*	CCCCTCTGCTGCACTCTA	(Wagner et al., 1995)	CY3
	CNEU		TTCCATCCCCCTCTGCCG		/
NOBmix	NIT3	*Nitrobacter spp*	CCTGGCTCCATGCTCCG	(Wagner et al., 1996)	405
	CNIT3		CCTGTGCTCCAGGCTCCG		/
AMX	Amx820	*Candidatus Brocadia anammoxidans* *Candidatus Kuenenia stuttgartiensis*	AAAACCCCTCTACTTAGTGCCC	(Schmid et al., 2000)	CY5

References

Chen R, Ji J, Chen Y, Takemura Y, Liu Y, Kubota K, Ma H, Li Y Y (2019). Successful operation performance and syntrophic micro-granule in partial nitritation and anammox reactor treating low-strength ammonia wastewater. Water Research, 155: 288–299

Daims H, Brühl A, Amann R, Schleifer K H, Wagner M (1999). The domain-specific probe EUB338 is insufficient for the detection of all Bacteria: development and evaluation of a more comprehensive probe set. Systematic and Applied Microbiology, 22(3): 434–444

Mobarry, B K, Wagner M, Urbain V, Be R, Stahl Da (1996). Phylogenetic probes for analyzing abundance and spatial organization of nitrifying bacteria single. Applied and Environmental Microbiology,63: 815

Schmid M, Twachtmann U, Klein M, Strous M, Juretschko S, Jetten M, Metzger J W, Schleifer K H, Wagner M (2000). Molecular evidence for genus level diversity of bacteria capable of catalyzing anaerobic ammonium oxidation. Systematic and Applied Microbiology, 23(1): 93–106

Wagner M, Gabriele R, Koops H P, Janine F, Rudolf A (1996). In situ analysis of nitrifying bacteria in sewage treatment plants. Water Science and Technology, 34(1–2): 237–244

Wagner M, Gabriele R, Rudolf A, Hans Pe K, Karl H S (1995). In situ identification of ammonia-oxidizing bacteria. Systematic and Applied Microbiology, 18(2): 251–264