Supplementary Materials

Figure S1. Experimental setup of laboratory-scale AAO-MBR system.

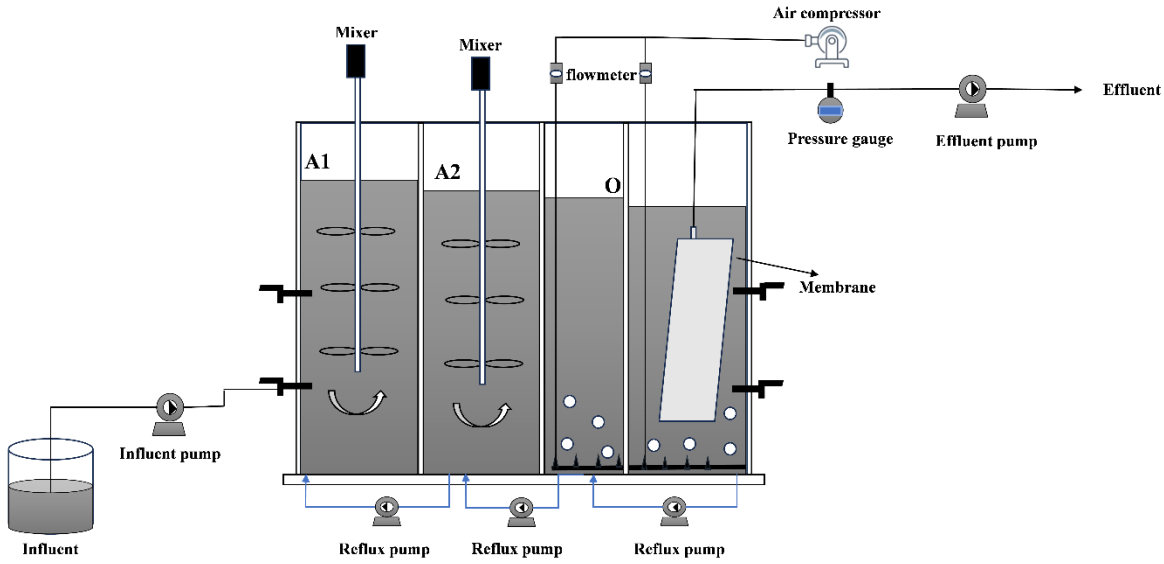

Fig. S1 Experimental setup of laboratory-scale AAO-MBR system (A1: anaerobic tank, A2: anoxic tank, O: aerobic tank).

Figure S2. Microbial relative abundance at the phylum level (top 10) based on ASVs under different SRTs.

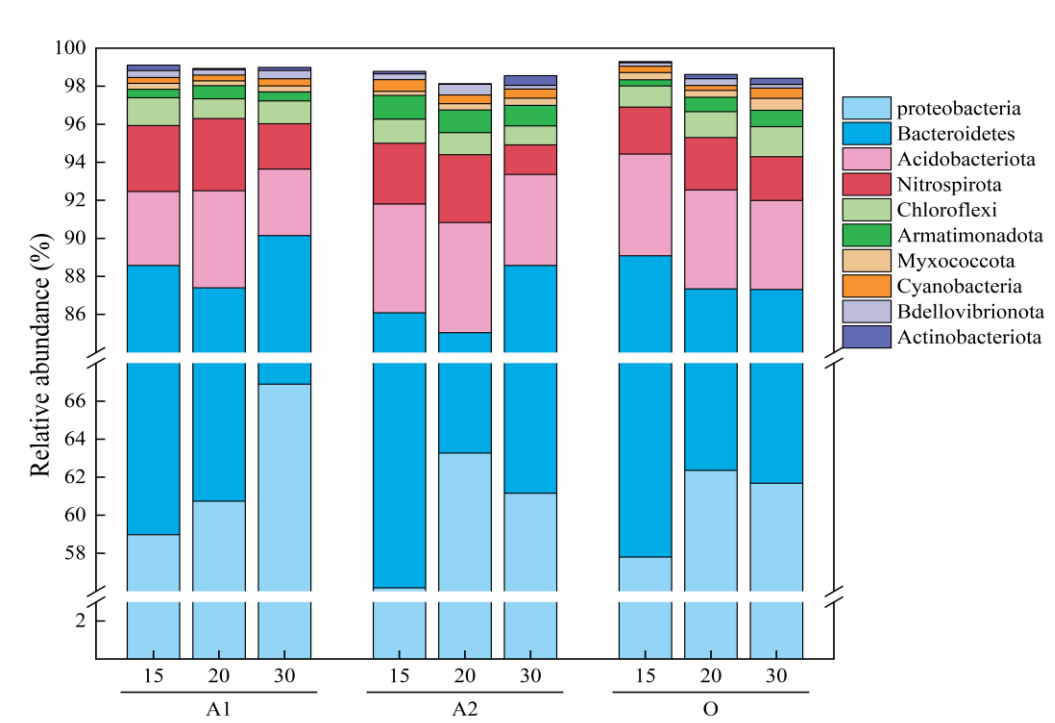

Fig. S2 Microbial relative abundance at the phylum level (top 10) based on ASVs under different SRTs.

Figure S3. Metabolic characteristics of activated sludge under varying SRTs.

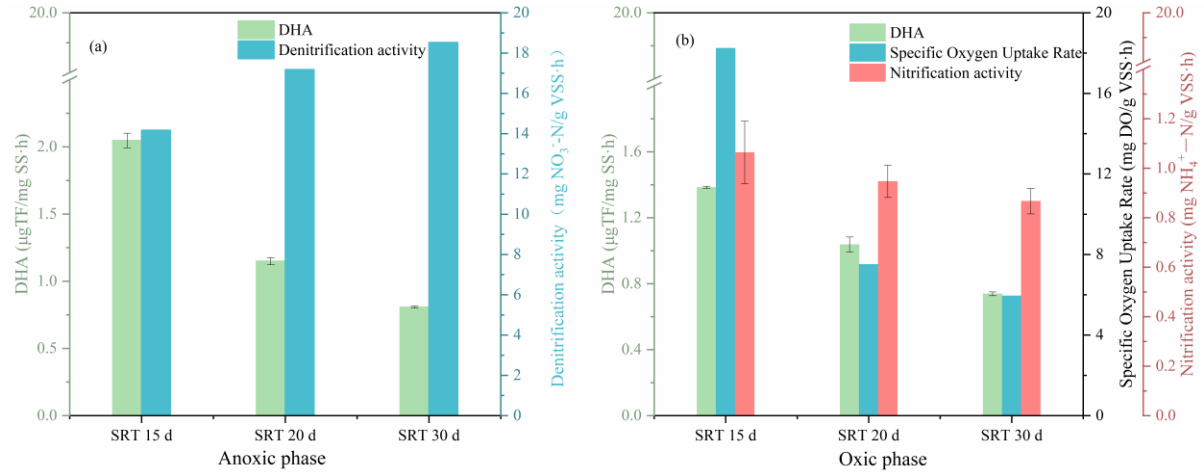

Fig. S3 Metabolic characteristics of activated sludge under varying SRTs. (a) Anoxic phase, (b) Oxic phase.

Figure S4. TN removal efficiency along the process of C-MBR (a) and μGAC-MBR (b) under varying SRTs.

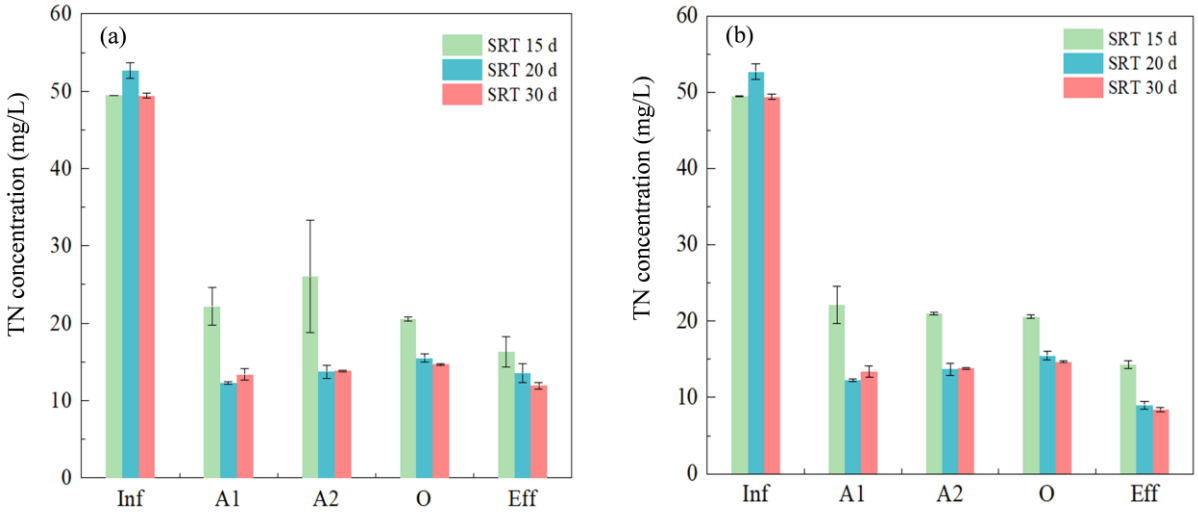

Fig. S4 TN removal efficiency along the process of C-MBR (a) and μGAC-MBR (b) under varying SRTs.

Figure S5. Effects of μGAC addition on simultaneous nitrification and denitrification (SND) under different sludge retention times (SRTs)

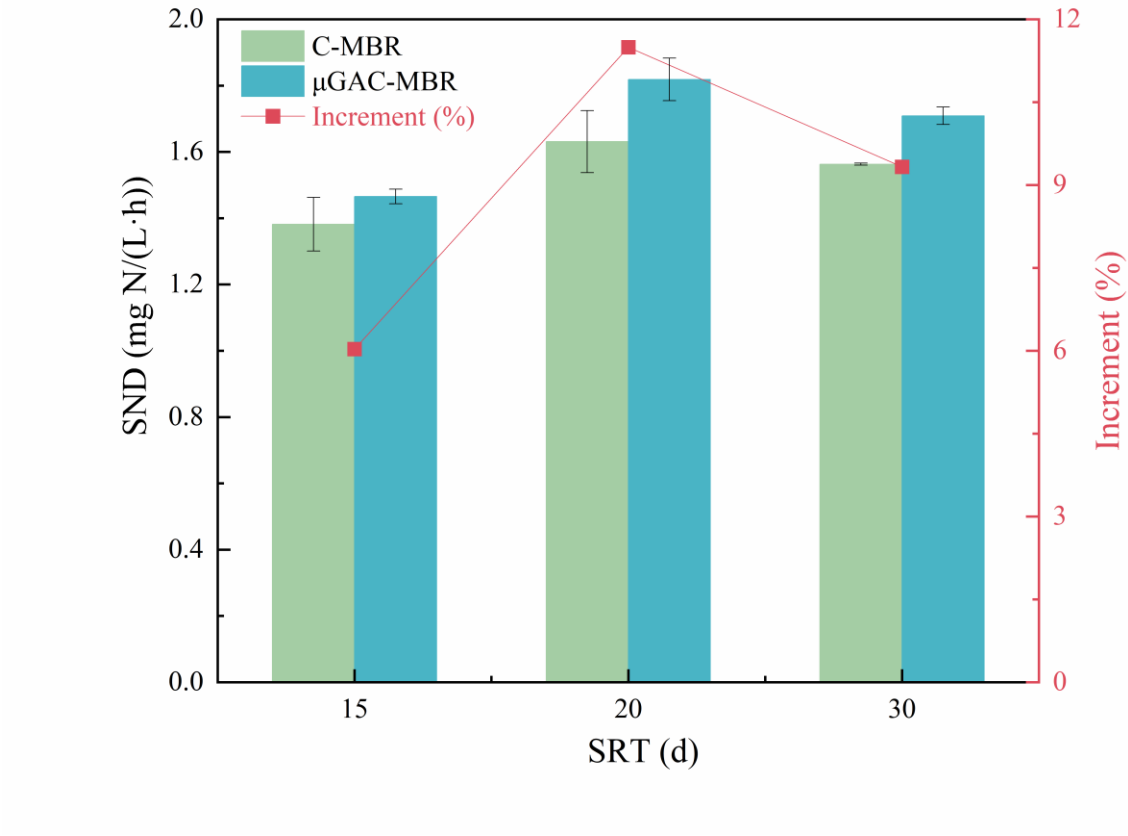

Fig. S5 Effects of μGAC addition on simultaneous nitrification and denitrification (SND) under different sludge retention times (SRTs).

Figure S6. Characterization of physicochemical properties of μGAC (a) AFM, (b) Contact angle.

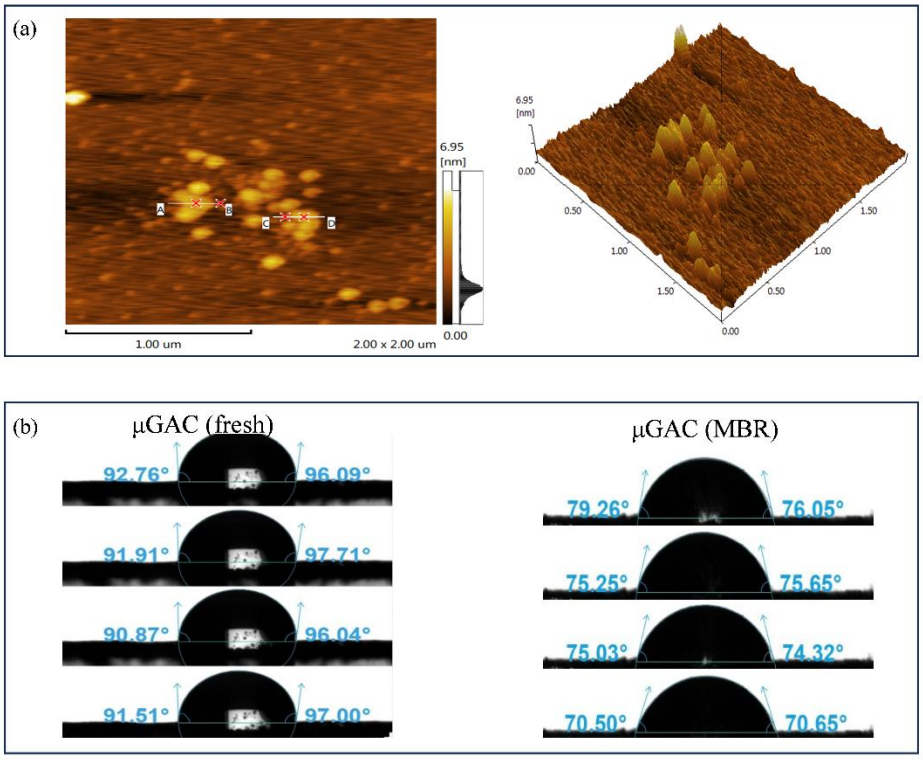

Fig. S6 Characterization of physicochemical properties of μGAC(a) AFM, (b) Contact angle.

Figure S7. Performance of the μGAC-MBR system on removal efficiency of COD_{cr} (a), NH_4^+—N (b), and TN (c).

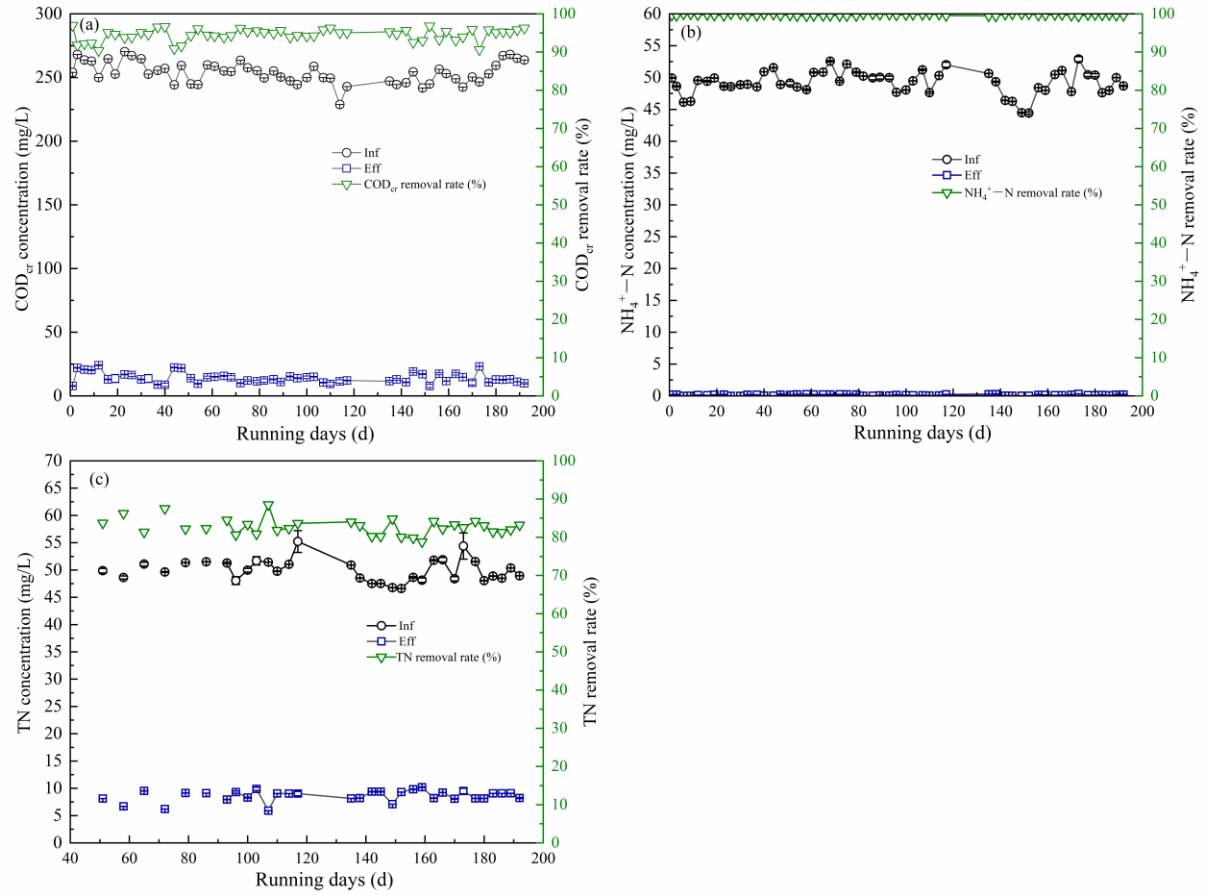

Fig. S7 Performance of the μGAC-MBR system on removal efficiency of COD_{cr} (a), NH_4^+—N (b), and TN (c).

Figure S8. Abundances of bacterial genera associated with nitrogen metabolism and emerging contaminant removal in activated sludge and cake layer of the C-MBR.

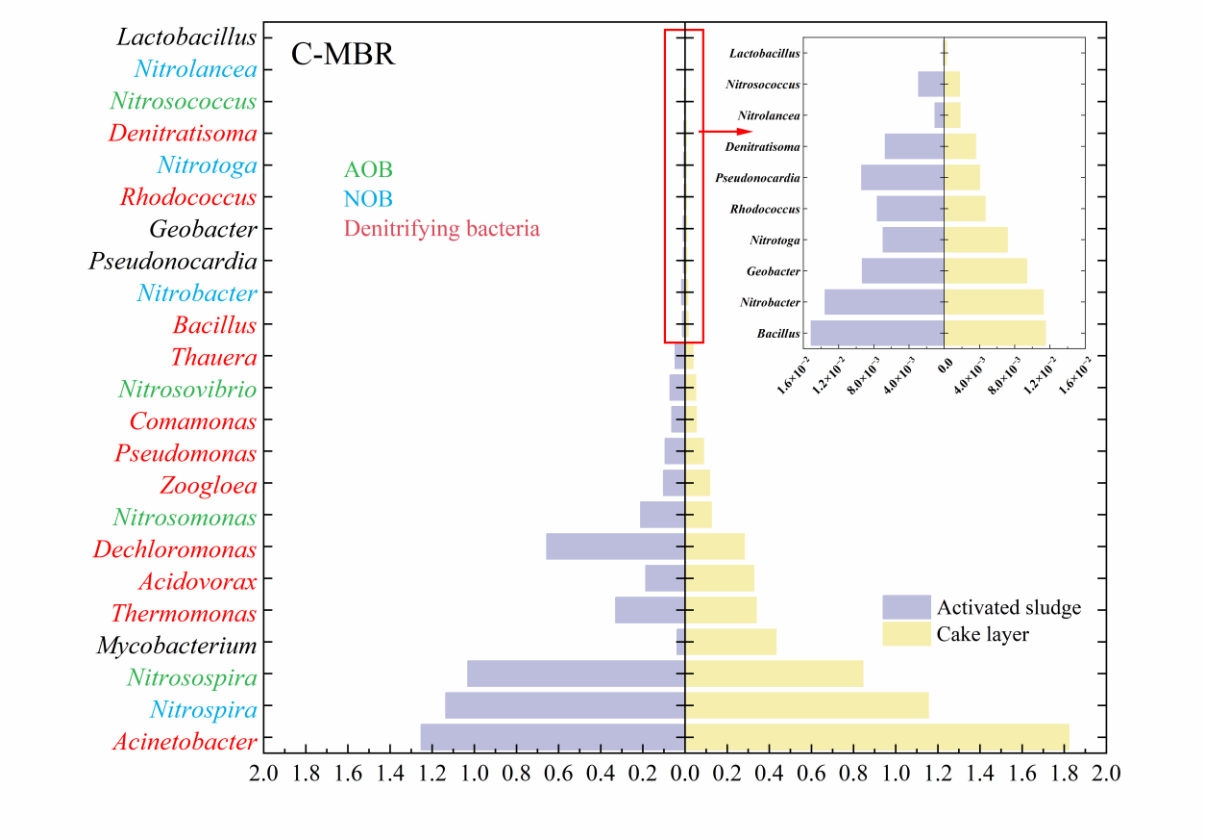

Fig. S8 Abundances of bacterial genera associated with nitrogen metabolism and emerging contaminant removal in activated sludge and cake layer of the C-MBR.

Table S1 Purity, manufacturer, and country of origin of the experimental reagents.

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Reagent name	Purity	Manufacturer	Country of origin
CH_3COONa	99%	Macklin	CHINA
NH_4Cl	99.8%	Macklin	CHINA
KH_2PO_4	99.8%	Macklin	CHINA
$FeCl_3 \cdot 6H_2O$	99%	Macklin	CHINA
H_3BO_3	＞99.8%	Macklin	CHINA
$CuSO_4$	AR，99.0%	Macklin	CHINA
KI	AR，≥99.0%	Macklin	CHINA
$MnCl_2 \cdot 4H_2O$	AR，99.9%	Macklin	CHINA
$NaMoO_4 \cdot 2H_2O$	AR	FUCHEN	CHINA
$CoCl_2 \cdot 6H_2O$	99.0%	Macklin	CHINA
$ZnSO_4 \cdot 7H_2O$	AR，99.5%	Macklin	CHINA
DisodiumEDTA	99%	Macklin	CHINA