Impacts of sulfide on mixotrophic denitrification by *Thauera*-dominated denitrifying sludge

Zhensheng Liang[1, a], Jianliang Sun[1, a], Chungeng Zhan[1], Siting Wu[1], Liang Zhang[2], Feng Jiang[3,*]

1. Guangdong Provincial Key Laboratory of Chemical Pollution and Environmental Safety & MOE Key Laboratory of Theoretical Chemistry of Environment, School of Environment, South China Normal University, Guangzhou 510006, China
2. Advanced Environmental Biotechnology Centre, Nanyang Environment & Water Research Institute, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, Singapore
3. School of Environmental Science and Engineering, Sun Yat-sen University, Guangzhou 510006, China

* Corresponding author. Prof. Feng Jiang; Email: dr.jiangf@gmail.com/ jiangf58@mail.sysu.edu.cn

[a] Shared first authorship

Supporting information

Table S1. Chemical compositions of the trace element solution.

Table S2. The experimental conditions for the batch tests.

Figure S1. The reactor used for the batch tests.

Figure S2. Microbial community analysis of the heterotrophic and *Thauera*-dominated denitrifying sludge: Rarefaction curves. The OTUs were defined by 3% distance.

Figure S3. (A-E) Time-dependent concentration profiles of nitrate, nitrite and sulfide in batch reactors with the *Thauera*-dominated denitrifying sludge at initial sulfide concentrations of 0-72 mg S/L and pH 7.5.

Figure S4. (A-E) Time-dependent concentration profiles of nitrate, nitrite and sulfide in batch reactors with the heterotrophic denitrifying sludge at initial sulfide concentrations of 0-72 mg S/L and pH 7.5.

Figure S5. Sulfide removal percentages in the batch reactors with the heterotrophic and *Thauera*-dominated denitrifying sludge at different initial sulfide concentrations.

Figure S6. The rates of nitrate reduction, nitrite accumulation and sulfide removal in the batch reactors with the heterotrophic and *Thauera*-dominated denitrifying sludge with the presence of sulfide alone.

Table S1. Chemical compositions of the trace element solution.

Components	Concentration (g/L)
$FeCl_3 \cdot 6H_2O$	0.50
H_3BO_3	0.20
$CuSO_4$	0.05
KI	0.08
$MnSO_4 \cdot H_2O$	0.25
$ZnSO_4 \cdot 7H_2O$	0.15
$CoCl_2 \cdot 6H_2O$	0.20

Table S2. The experimental conditions for the batch tests.

Test		TOC (mg /L)	Nitrate or nitrite (mg N/L)	Dissolved sulfide (mg S/L)	pH	Nitrogen source
Batch Test I	1	120	56	0	7.5	Nitrate
	2	120	56	6	7.5	Nitrate
	3	120	56	16	7.5	Nitrate
	4	120	56	32	7.5	Nitrate
	5	120	56	72	7.5	Nitrate
Batch Test II	6	120	56	32	7.0	Nitrate
	7	120	56	32	7.5	Nitrate
	8	120	56	32	8.5	Nitrate
Supplementary tests	9	120	14	32	7.0	Nitrite
	10	120	14	32	7.5	Nitrite
	11	120	14	32	8.5	Nitrite
	12	0	56	32	7.5	Nitrate

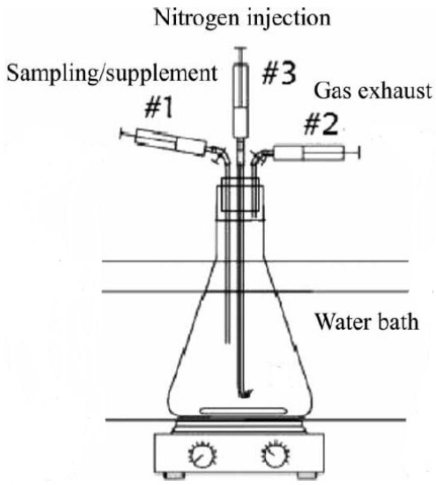

Figure S1. The reactor used for the batch tests.

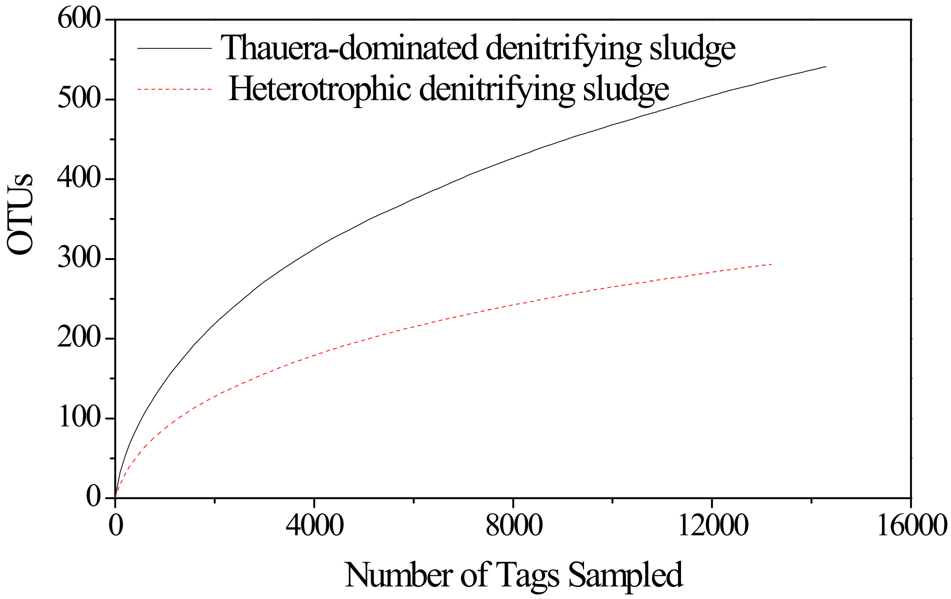

Figure S2. Microbial community analysis of the heterotrophic and *Thauera*-dominated denitrifying sludge: Rarefaction curves. The OTUs were defined by 3% distance.

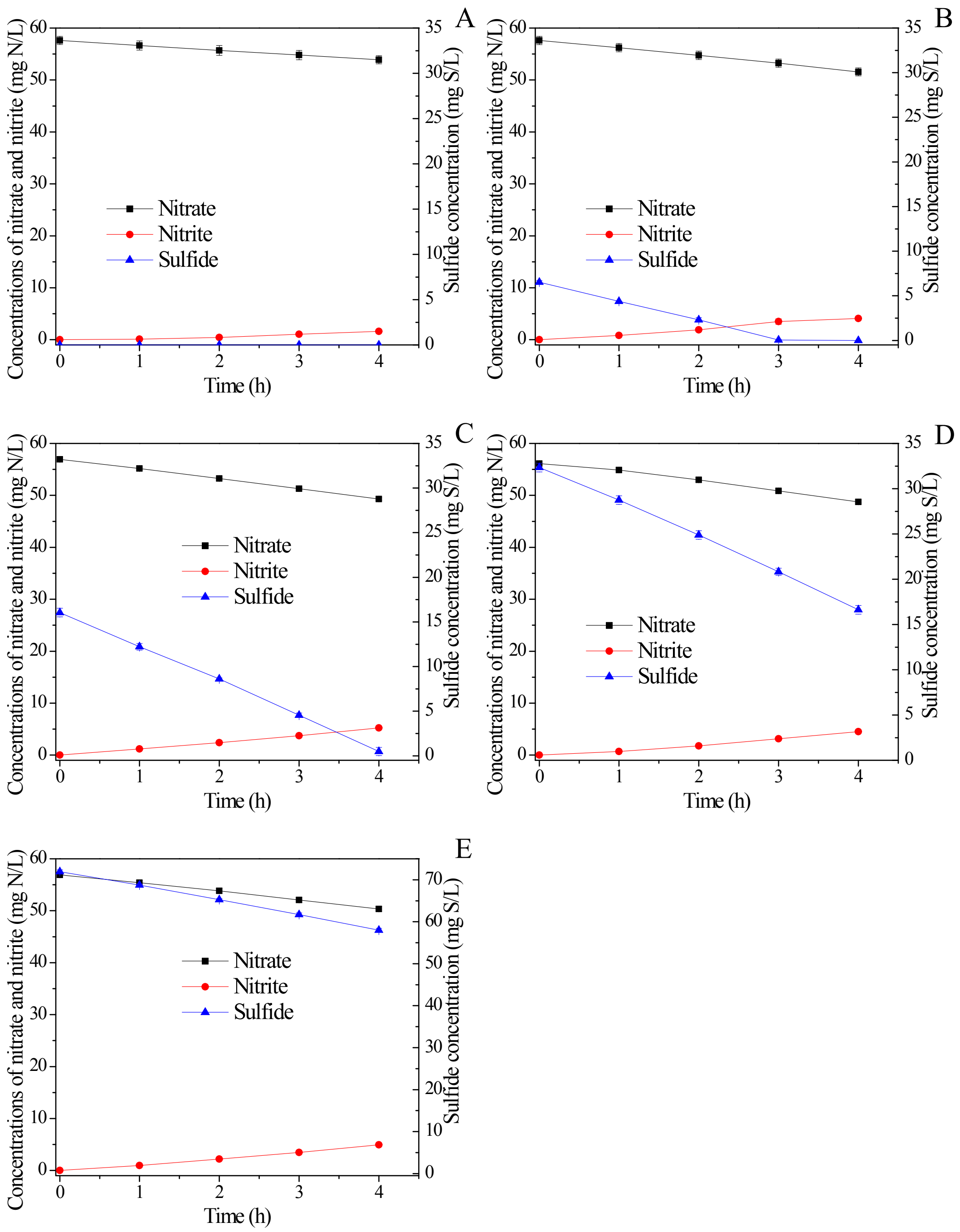

Figure S3. (A-E) Time-dependent concentration profiles of nitrate, nitrite and sulfide in batch reactors with the *Thauera*-dominated denitrifying sludge at initial sulfide concentrations of 0-72 mg S/L and pH 7.5.

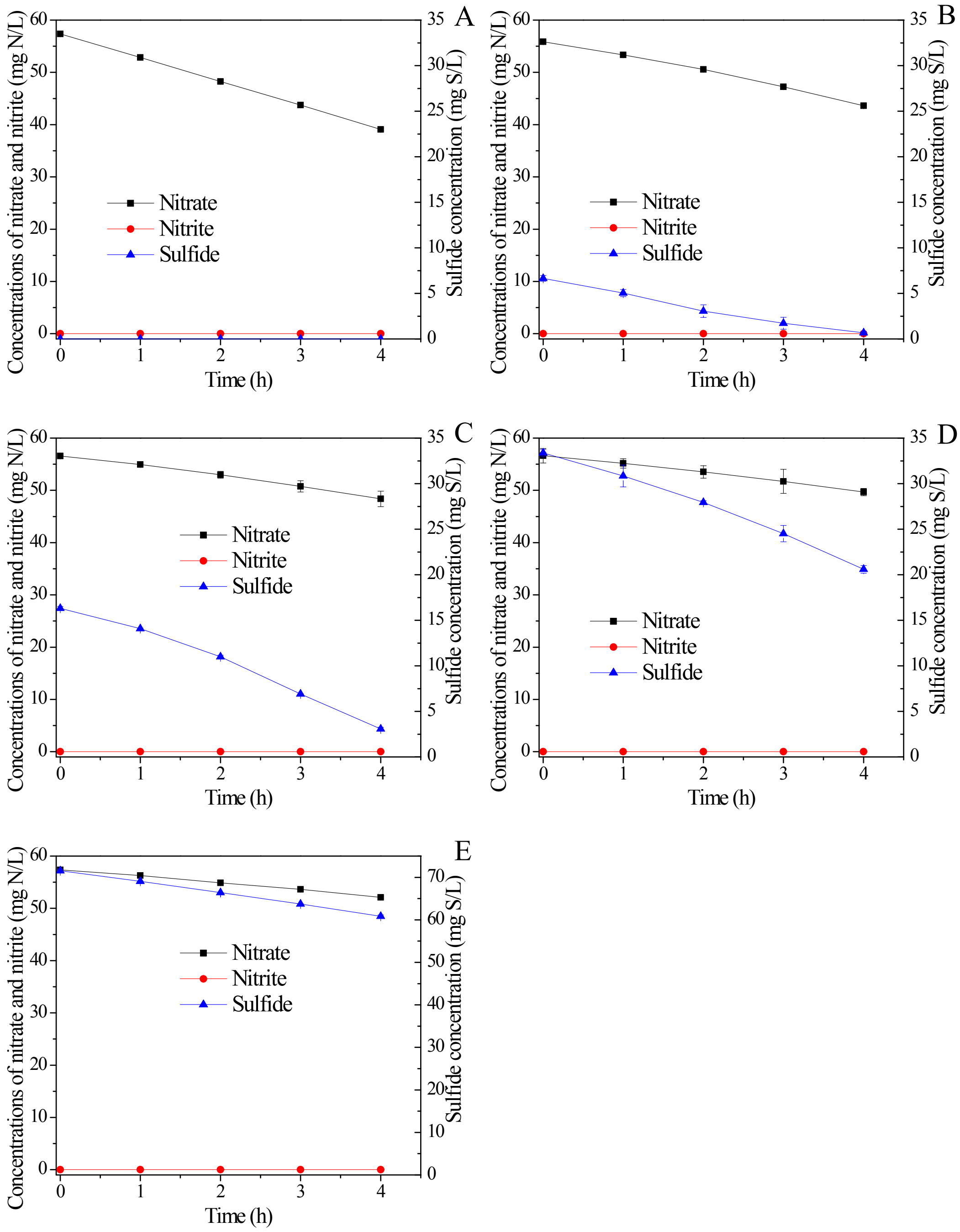

Figure S4. (A-E) Time-dependent concentration profiles of nitrate, nitrite and sulfide in batch reactors with the heterotrophic denitrifying sludge at initial sulfide concentrations of 0-72 mg S/L and pH 7.5.

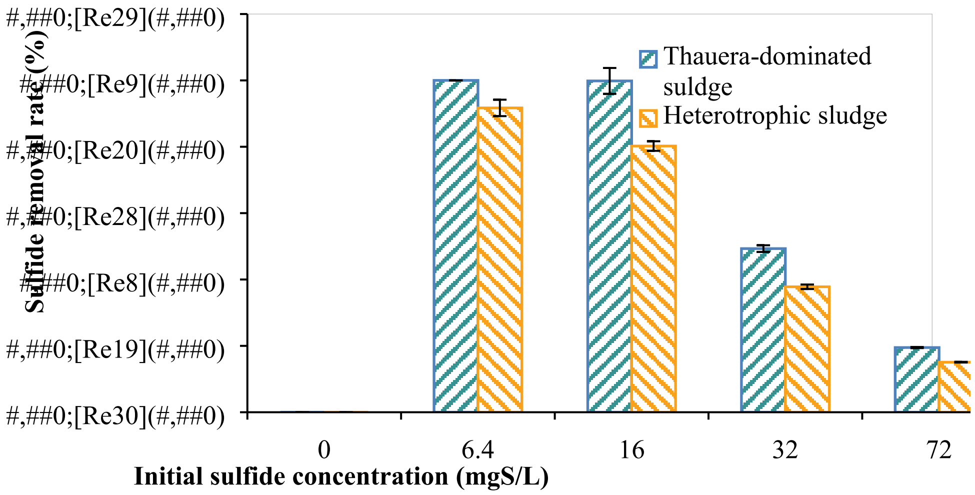

Figure S5. Sulfide removal percentages in the batch reactors with the heterotrophic and *Thauera*-dominated denitrifying sludge at different initial sulfide concentrations.

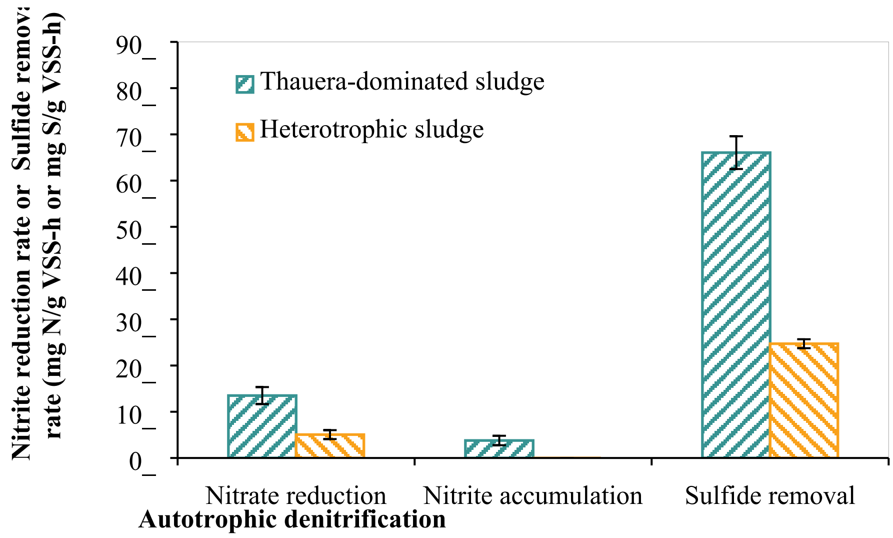

Figure S6. The rates of nitrate reduction, nitrite accumulation and sulfide removal in the batch reactors with the heterotrophic and *Thauera*-dominated denitrifying sludge with the presence of sulfide alone.