Supplemental Material

1. Calculation of removal percentage and conversion percentage

2. MiSeq high-throughput sequencing

3. Fig.S1 Fitting equation of simultaneous sulfide and nitrate removal process

1. Calculation of removal percentage and conversion percentage

Removal percentage was calculated by substrate removal concentration in terms of corresponding influent substrate concentration (Eq. 3); while conversion percentage was calculated by product concentration in terms of corresponding substrate removal concentration (Eq. 4).

$$\text{Removal percentage}=(SC_{inf}-SC_{eff})/SC_{inf}\times100\% \qquad (3)$$

$$\text{Conversion percentage}= PC/(SC_{inf}-SC_{eff})\times100\% \qquad (4)$$

Where: SC_{inf} is the influent substrate concentration (mg/L); SC_{eff} is the effluent substrate concentration (mg/L), and PC_{eff} is the amount of product generated by corresponding substance (mg/L).

2. MiSeq high-throughput sequencing

Major Biotech (Shanghai, China) performed DNA extraction, polymerase chain reaction and high-throughput sequencing of the sludge samples after washing by the phosphate buffer solution several times. The primers used in PCR were 338F(5'-ACTCCTACGGGAGGCAGCAG-3') and 806R(5'-GGACTACHVGGGTETCTAAT-3'). Operational Taxonomic Units (OTUs) were clustered with a cutoff level of 97% similarity using UPARSE (version 7.1, http://drive5.com/uparse/), and chimeric sequences were identified and removed using the UCHIME algorithm. The RDP Classifier (http://rdp.cme.msu.edu/) performed phylogeny analysis of each genetic sequence belong to16S rRNA gene against the silva (SSU115)16S rRNA database for confidence threshold of 70%. The microbial community richness was characterized by ACE index and Chao index. The microbial community diversity was assessed by Shannon and Simpson indices. The richness and diversity analysis were calculated by using the Mothur software (version v.1.30.1, http://www.mothur.org).

3. Fig.S1 Fitting equation of simultaneous sulfide and nitrate removal process

A

$y=24.65x/(2.26+x)$
$R^2=0.9038$

$y=21.40x/(4.22+x)$
$R^2=0.9959$

$y=21.10x/(4.00+x)$
$R^2=0.9826$

- ■ S/N=5:1
- ● S/N=5:1.5
- ▲ S/N=5:2

Sulfide removal rate (mg/(L·h))

Eff. sulfide (mg/L)

B

$y=5.59x/((x+2.49)(1+x/84.17))$
$R^2=0.5866$

$y=4.99x/((x+3.84)(1+x/52.40))$
$R^2=0.6004$

$y=2.67x/(2.06+x)$
$R^2=0.8740$

- ■ S/N=5:1
- ● S/N=5:1.5
- ▲ S/N=5:2

Nitrate removal rate(mg/(L·h))
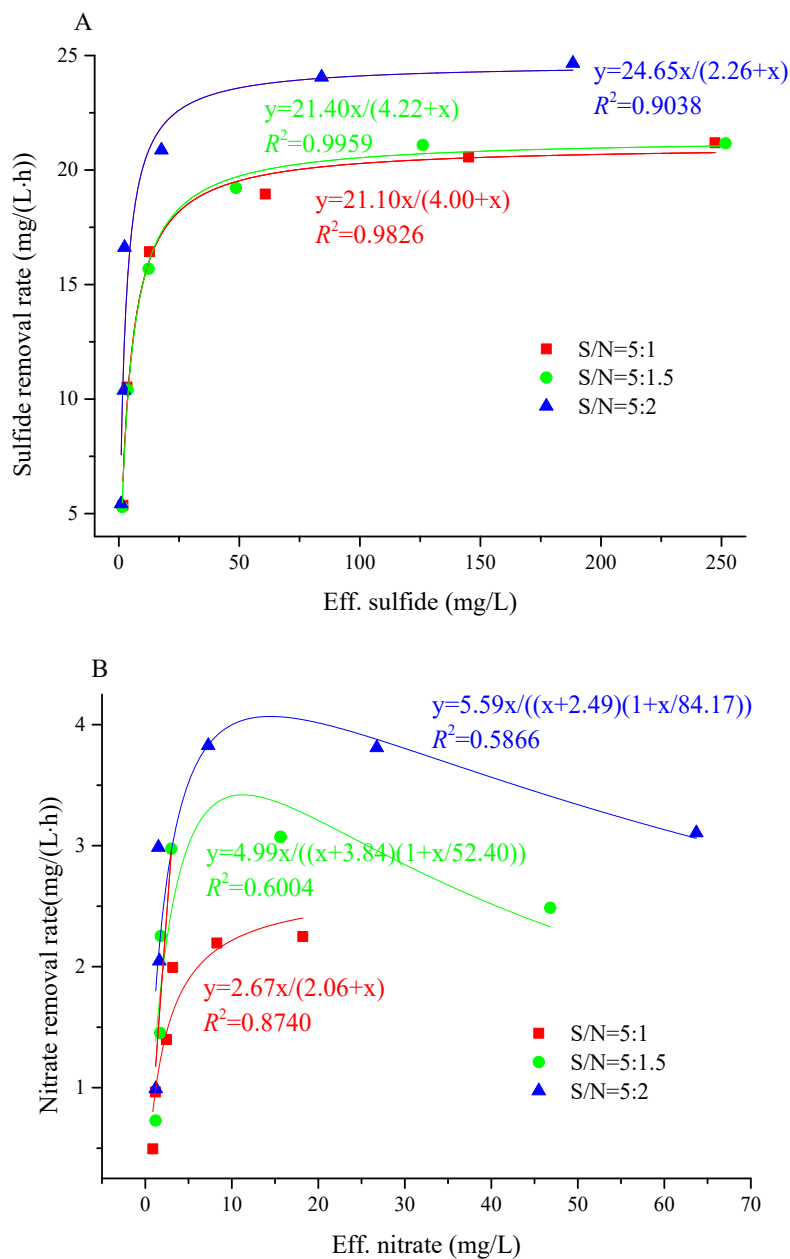
Eff. nitrate (mg/L)

Fig.1S Fitting equation of simultaneous sulfide and nitrate removal process

(A.Sulfide; B.Nitrate)