Short Communication

Mitigating adverse impacts of varying sulfide/nitrate ratios on denitrifying sulfide removal process performance

Chuan Chen, Bo Shao, Ruo-Chen Zhang, Xi-Jun Xu, Xu Zhou, Yuan Yuan, Nan-Qi Ren, Duu-Jong Lee

PII: S0960-8524(18)31025-3
DOI: https://doi.org/10.1016/j.biortech.2018.07.096
Reference: BITE 20226

To appear in: *Bioresource Technology*

Received Date: 13 June 2018
Revised Date: 17 July 2018
Accepted Date: 18 July 2018

Please cite this article as: Chen, C., Shao, B., Zhang, R-C., Xu, X-J., Zhou, X., Yuan, Y., Ren, N-Q., Lee, D-J., Mitigating adverse impacts of varying sulfide/nitrate ratios on denitrifying sulfide removal process performance, *Bioresource Technology* (2018), doi: https://doi.org/10.1016/j.biortech.2018.07.096

Mitigating adverse impacts of varying sulfide/nitrate ratios on denitrifying sulfide removal process performance

Chuan Chen[a], Bo Shao[a], Ruo-Chen Zhang[a], Xi-Jun Xu[a], Xu Zhou[b], Yuan Yuan[c], Nan-Qi Ren[a], Duu-Jong Lee[d,e,*]

[a]State Key Laboratory of Urban Water Resource and Environment, School of Environment, Harbin Institute of Technology, Harbin, Heilongjiang Province, 150090, China; [b]Engineering Laboratory of Microalgal Bioenergy, Shenzhen Graduate School, Harbin Institute of Technology, Shenzhen, 518055, China; [c]Department of Biotechnology, Beijing Polytechnic, Beijing, 100029, China; [d]Department of Chemical Engineering, National Taiwan University, Taipei 106, Taiwan; [e]Department of Chemical Engineering, National Taiwan University of Science and Technology, Taipei 106, Taiwan

[*]Corresponding author: Duu-Jong Lee, Department of Chemical Engineering, National Taiwan University, Taipei 106, Taiwan; email: djlee@ntu.edu.tw

Abstract:

Complete removal of nitrogen, sulfur and carbon in wastewaters by denitrifying sulfide removal (DSR) process can be achieved at stoichiometry sulfide to nitrate ratio (S/N) of 1:1 in expanded granular sludge bed reactor. Wastewaters with varying S/N ratios can adversely impact the DSR performances with deterioration of synergetic cooperation between autotrophic and heterotrophic denitrifiers. DO (dissolved oxygen) serves effectively as supplementary electron receiver for sulfide oxidation, leaving more nitrate for heterotrophic denitrifiers to utilize acetate. The optimal oxygen to sulfide molar ratio (DO/S) is 0.5:1 for complete removal of sulfide, nitrate and acetate at different S/N ratios. The heterotrophic denitrification rate was decreased to 0.03±0.002, 0.24±0.011 and 0.35±0.027 NO_3^--N•h^{-1}•$gVSS^{-1}$ at S/N ratio of 5:2, 5:5 and 5:8, respectively, when DO/S of 3:1 was performed. This optimal condition was proposed as an easy-to-implement control criterion for subsiding the adverse impact by varying S/N ratios in handling real wastewaters.

Keywords: Denitrifying sulfide removal; sulfur oxidizing bacteria; dissolved oxygen; aerobic biological oxidation