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Short Communication

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

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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 $\text{NO}_3^- \cdot \text{N} \cdot \text{h}^{-1} \cdot \text{gVSS}^{-1}$ 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

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