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## Denitrifying Sulfide Removal by Enriched Microbial Consortium: Kinetic diagram

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### Abstract

Denitrifying sulfide removal (DSR) process simultaneously removes nitrate, sulfide and organic matters in the same reactor. This study isolated eight DSR strains and composed a microbial consortium to reveal the stoichiometry and kinetics of autotrophic, heterotrophic and mixotrophic denitrification (DSR). A novel kinetic diagram based on mass and electron balances was proposed to graphically interpret the system kinetics and identify the accessible regime where DSR reactions can be applied. Demonstration of the use of the proposed diagram showed the easy assessment of DSR system performance by the status on the diagram.

### 1. INTRODUCTION

Organic matters in wastewaters can be converted to methane via anaerobic digestion processes. When sulfate is present in the wastewaters, the sulfate-reducing bacteria (SRB) can convert sulfate to sulfide ( $S^{2-}$ ), which can then inhibit activities of methanogens (Quevedo *et al.*, 1996). On the other hand, when nitrate is present in the feed for anaerobic digester, the intermediates for denitrification reactions are also noted inhibitory to methanogens' activities (Tugtas and Pavlostathis, 2007). When both nitrate and sulfide are present in an anaerobic digester, the simultaneous reactions of nitrate,  $S^{2-}$ , and organic carbons, the so-called denitrifying sulfide

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