

Simultaneous degradation of anodic nitrate and cathodic sulphate in a bioelectrochemical reactor: evaluation of degradation efficiency and characterization of microbial communities

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ABSTRACT

Sulphate and nitrate as respiratory electron acceptors widely exist in various water bodies and are potentially harmful contaminants. In this study, we hypothesized that simultaneous removal of anodic nitrate and cathodic sulphate in a bioelectrochemical reactor (BER) can be accomplished. Results indicated that the average nitrate removal efficiency, sulphate removal efficiency, nitrite production efficiency, and ammonia production efficiency were 38.84, 22.10, 4.56 and 0.38 mg/L, respectively. Simultaneous degradation of anodic nitrate and cathodic sulphate in BER was accomplished, although the obtained results suggested that the removal efficiencies of nitrate and sulphate were not as good as those of conventional biological treatments. The existence of dominant species *Pseudomonas* and *Azoarcus* in the anode proved that nitrate was reduced by nitrate-reducing bacteria with acetate as the electron donor. In the cathode, *Desulfomicrobium* and *Thauera* were the main functional bacteria for sulphate reduction.

Keywords: Bioelectrochemical reactor (BER); Anodic nitrate removal; Cathodic sulphate removal; Bacterial community structure

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