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Enhancement of bacterial denitrification for nitrate removal in groundwater with electrical stimulation from microbial fuel cells

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Electricity generated from the microbial fuel cell (MFC) is applied to the bioelectrical reactor (BER) directly as electrical stimulation means for enhancement of bacterial denitrification to remove nitrate effectively from groundwater. With maximum power density of 502.5 mW m -2 and voltage outputs ranging from 500 mV to 700 mV, the nitrate removal is accelerated, with less intermediates accumulation, compared with control sets without electrical stimulation. Denitrification bacteria proliferations and activities are promoted as its number and Adenosine-5'-triphosphate (ATP) concentration increased one order of magnitude (3.5 × 107 in per milliliter biofilm solution) and about 1.5 folds, respectively. Effects of electricity from MFCs on enhancement of bacterial behaviors are demonstrated for the first time. These results indicate that MFCs can be applied in the in-situ bioremediation of nitrate polluted groundwater for efficiency improvement.

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