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Evaluating the potential for dissimilatory nitrate reduction by anammox bacteria for municipal wastewater treatment

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ABSTRACT

Anammox bacteria can perform dissimilatory nitrate reduction to ammonium (DNRA) with nitrite as intermediate coupled to the oxidation of volatile fatty acids (VFA). Batch tests with enriched anammox and a co-culture of anammox and heterotrophic bacteria showed the capacity of *Candidatus* 'Brocadia fulgida' to perform the DNRA coupled to the anammox reaction (DNRA-anammox) at a high rate although the culture was not previously adapted to VFA. From thermodynamic calculations it could be stated that low COD/N influent ratios favour the DNRA-anammox transformation over heterotrophic conversions since more free energy is gained. A process scheme is proposed for an innovative nitrogen removal system in which the nitrate produced by nitrite oxidizing bacteria and/or anammox bacteria is converted during DNRA-anammox pathway, resulting in a sustainable nitrogen removal from municipal wastewater while circumventing the troublesome out-selection of nitrite oxidizing bacteria encountered in mainstream applications.

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