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

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1 Evaluating the potential for dissimilatory nitrate reduction by anammox

2 bacteria for municipal wastewater treatment

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11 **ABSTRACT**

12 Anammox bacteria can perform dissimilatory nitrate reduction to ammonium (DNRA)

13 with nitrite as intermediate coupled to the oxidation of volatile fatty acids (VFA). Batch

14 tests with enriched anammox and a co-culture of anammox and heterotrophic bacteria

15 showed the capacity of *Candidatus* 'Brocadia fulgida' to perform the DNRA coupled to

16 the anammox reaction (DNRA-anammox) at a high rate although the culture was not

17 previously adapted to VFA. From thermodynamic calculations it could be stated that

18 low COD/N influent ratios favour the DNRA-anammox transformation over

19 heterotrophic conversions since more free energy is gained. A process scheme is

20 proposed for an innovative nitrogen removal system in which the nitrate produced by

21 nitrite oxidizing bacteria and/or anammox bacteria is converted during DNRA-

22 anammox pathway, resulting in a sustainable nitrogen removal from municipal

23 wastewater while circumventing the troublesome out-selection of nitrite oxidizing

24 bacteria encountered in mainstream applications.

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