

Phosphate removal from the returned liquor of municipal wastewater treatment plant using iron-reducing bacteria

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2004/0884: received 30 July 2004, revised 11 November 2004 and accepted 12 November 2004

ABSTRACT

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Aim: The application of iron-reducing bacteria (IRB) to phosphate removal from returned liquor (liquid fraction after activated sludge digestion and anaerobic sludge dewatering) of municipal wastewater treatment plant (WWTP) was studied.

Methods and Results: An enrichment culture and two pure cultures of IRB, *Stenotrophomonas maltophilia* BK and *Brachymonas denitrificans* MK identified by 16S rRNA gene sequencing, were produced using returned liquor from a municipal WWTP as carbon and energy source, and iron hydroxide as oxidant. The final concentration of phosphate increased from 70 to 90 mg l⁻¹ in the control and decreased from 70 to 1 mg l⁻¹ in the experiment. The mass ratio of removed P to produced Fe(II) was 0.17 g P g⁻¹ Fe(II). The strain *S. maltophilia* BK showed the ability to reduce Fe(III) using such xenobiotics as diphenylamine, m-cresol, 2,4-dichlorophenol and p-phenylphenol as sole sources of carbon under anaerobic conditions.

Conclusions: Bacterial reduction of ferric hydroxide enhanced the phosphate removal from the returned liquor.

Significance and Impact of the Study: The ability of the facultative anaerobes *S. maltophilia* BK and *B. denitrificans* MK to reduce Fe(III) was shown. These micro-organisms can be used for anaerobic removal of phosphate and xenobiotics by bacterial reduction of ferric ions.

Keywords: iron-reducing bacteria, municipal wastewater, phosphate, returned liquor.

ACKNOWLEDGEMENTS

The research was supported by a grant from the Nanyang Technological University, Republic of Singapore. The authors thank Mr Z. Xing for the technical help in the performance of this research.

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