Title:

2-Fluorophenol degradation by aerobic granules in a sequencing batch reactor

Authors & affiliations:

A.F. Duque[1], V.S. Bessa[1], M.F. Carvalho[1], M.K. de Kreuk[2], M.C.M. van Loosdrecht[2] and P.M.L. Castro[1]

[1]CBQF/Escola Superior de Biotecnologia – Universidade Católica Portuguesa
Rua Dr. António Bernardino de Almeida, 4200-072 Porto Portugal

[2]Department of Biotechnology, Delft University of Technology, Julianalaan 67, 2628BC Delft, The Netherlands

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Granular sequencing batch reactors (SBR) constitute a novel biofilm technology for the treatment of wastewaters. These bioreactor systems present high biomass retention and have especially gained interest during the last 5 years, after the observation that also heterotrophic aerobic bacteria can be grown in granules similar to anaerobic granular sludge reactors. Aerobic granular sludge is extremely promising for the treatment of effluents containing toxic compounds, and it can economically compete with conventional activated sludge systems. The use of organofluorine compounds has increased during the last century. Nevertheless, biodegradation of fluorinated compounds, among them fluorophenols, has been scarcely investigated. As these pollutants occur in wastewaters discontinuously and at low concentrations, maintenance of a good population of organofluorine compound degraders in bioreactors is highly desirable.

The main aim of this study was to investigate the robustness and performance of a laboratory scale SBR towards shock loadings of 2-fluorophenol (2FP). A stable operated SBR was, during ca 3 months, intermittently fed with 0.22 mM of 2FP added to an acetate containing medium. No biodegradation of the target compound was observed. Bioaugmentation with a specialised bacterial strain able to degrade 2FP was subsequently performed. The reactor was thereafter fed with 0.22-0.44 mM of 2FP for 7 months. Full degradation of the compound was reached, with a stoichiometric fluoride release. This indicates the need for bioaugmentation in cases where biodegradation of highly recalcitrant compounds is targeted. The success of augmentation was followed by molecular methods (DGGE, FISH) in order to clarify the role of the inoculated strain in the biodegradation process and the impact on the microbial community in the aerobic granules.

To our knowledge, this is the first study reporting bioaugmentation of aerobic granular sludge.

Acknowledgments:
A.F. Duque and M.F. Carvalho wish to acknowledge a research grant from Fundação para a Ciência e Tecnologia (FCT), Portugal (Ref. SFRH/BD/30771/2006 and SFRH/BPD/44670/2008, respectively) and Fundo Social Europeu (III Quadro Comunitário de Apoio). This work was supported by the FCT Project - PTDC/BIO/67306/2006.

Important notes:

Do **NOT** write outside the grey boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this form. Simply enter your information into the boxes. The form will be automatically processed – if you alter its structure your submission will not be processed correctly.