Modelling growth kinetics of *Streptomyces coelicolor* A3(2) in a continuously operated membrane gradostat reactor

D. De Jager[1,2], S.J. Fraser[2], W. Edwards[2] and M.S. Sheldon[1]

[1]Department of Chemical Engineering, Cape Peninsula University of Technology, P.O. Box 652, Cape Town, 8000, South Africa

[2]Synexa Life Sciences (Pty) Ltd, P.O. Box 1573, Bellville, 7535, South Africa

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Biofilm growth has a significant effect on both momentum and mass transfer processes within membrane bioreactors (MBR's). A fast emerging area of MBR applications is the immobilisation of micro organisms on the external surface of membranes for the production of secondary metabolites such as enzymes, antibiotics, anti-inflammatories, anticancer drugs and vitamins. Studying and identifying the growth kinetics in a continuously operated MBR's is important for modelling of the momentum and mass transfer process.

The purpose of this study was to quantify the growth kinetics of the filamentous bacterium *Streptomyces coelicolor* A3(2) immobilised on the external surface of ceramic membranes in single capillary membrane gradostat reactors (SCMGR). Capillary ceramic membranes have been shown to be very suitable for spore immobilisation and biofilm development. The asymmetric capillary ceramic membranes used in this study were made of aluminium oxide (α-Al_2O_3) and had an inside coating of aluminium oxide (α-Al_2O_3) with an average pore size of 40 nm. The growth curve obtained for *S. coelicolor* A3(2) from the experimental data showed the presence of two growth cycles, indicating biphasic growth. Kinetic growth models were fitted to the two growth cycles. The first cycle of the growth curve was from 66 to 162 hr followed by a slower growth cycle from 162 to 354 hr, which corresponded to literature where similar MGR systems were utilised. Due to repeated sloughing of the biofilm from the surface of the ceramic membrane at 354 hr this point could not be confirmed.

Keywords: Ceramic membranes; Membrane bioreactors; Growth kinetics; Mathematic modelling