Development under discontinuous operation of an anaerobic microbial community acclimated to high oleate loads

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Anaerobic conversion of lipid-rich effluents to biogas is enhanced when a discontinuous operation is applied\textsuperscript{1,2}. In this work, sludge changes during the discontinuous operation of an anaerobic reactor fed with an oleate-rich effluent\textsuperscript{3} were evaluated. Specific methanogenic activity (SMA) in the presence of acetate and H\textsubscript{2}/CO\textsubscript{2} and the influence of increasing oleic acid concentrations (between 0 and 900 mg/L) on the aceticlastic methanogenic activity were studied in batch assays, at the beginning and end (t = 213 days) of the operation. The shifts on the composition of bacterial and archaeal communities were also characterized by DGGE analysis of PCR amplified 16S rRNA fragments from sludge samples collected at time 0, 100 and 213 days. Aceticlastic and hydrogenotrophic SMA increased sharply from the beginning till the end of the operation, but the aceticlastic tolerance to oleate was not significantly affected, for all concentrations studied. Molecular techniques showed that bacterial community was more affected by the conditions imposed within the reactor than the archaeal one and that the major shift in the archaeal community was verified during the first 100 days of operation. The results obtained show that the operating conditions applied produced significant changes on the microbial community, leading to gradual development of a specialized consortium adapted to high oleate loads.

\textsuperscript{1} Pereira, M. A. et al. (2004) Biotechnology and Bioengineering \textit{88}:502-511.
\textsuperscript{3} Cavaleiro, A. J. et al. (2007) Proceedings of 11th World Congress on Anaerobic Digestion.

Principal component analysis of anaerobic azo dye biodecolorization with activated sludge

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Dyes are difficult to remove in conventional wastewater treatment systems. Most reported mechanisms for azo dye biodegradation involve azo bond cleavage in an anaerobic stage followed by aromatic amine mineralization in an aerobic stage\textsuperscript{1}. Thus, the applicability of anaerobic/aerobic Sequencing Batch Reactors (SBR) for the treatment of textile effluents containing azo dyes was studied\textsuperscript{2}. Chemometric analysis was applied to data obtained for the anaerobic biodecolorization of Acid Orange 7 with activated sludge produced in a SBR. A matrix with original data from 220 decolorization tests was constructed using 11 variables, of which 9 were manipulated parameters and 2 were indicators of decolorization efficiency. The parameters were the SBR feed and biomass collection regimes, sludge age, type and load of carbon source fed to the SBR, aeration regime, sulfate supplement in the feed, availability of sulfate and phosphate during decolorization and dye concentration. The efficiency indicators were the decolorization yield after 168 hours of reaction and the duration of the lag phase for the onset of dye reduction. A Principal Component Analysis model derived from this data matrix allowed the identification and quantification of the variables most correlated (positive or negatively) with the decolorization yield, namely the aeration regime, dye concentration and availability of sulfate and phosphate during dye reduction.

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\textsuperscript{1} Pandey, A. et al. (2007) International Biodeterioration & Biodegradation \textit{59}:73-84.