doi:10.5004/dwt.2019.24392

Stoichiometry and kinetics of hospital wastewater treatment in a submerged membrane bioreactor

Yusmel González-Hernández[a], Sylvie Schetrite[b], Claire Albasi[b], Marion Alliet[b], Ulises Jáuregui–Haza[a,c,*]

[a]*Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC-UH), Universidad de La Habana, La Habana, Cuba, email: yusmel@instec.cu, yusmel220687@yahoo.com (Y.G. Hernández), ulises.jauregui@infomed.sld.cu, ulises.jauregui@intec.edu.do (U.J.-Haza)*

[b]*Laboratoire de Génie Chimique, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France, email: sylvie.schetrite@free.fr (S. Schetrite), claire.albasi@ensiacet.fr (C. Albasi), marion.alliet@ensiacet.fr (M. Alliet)*

[c]*Instituto Tecnológico de Santo Domingo (INTEC), Santo Domingo, Dominican Republic*

ABSTRACT

The present article deals with the calibration and validation of a biological model of SMBR for hospital wastewater treatment using respirometry. In a first part, the stoichiometric and kinetic parameters are estimated and validated using the experimental oxygen uptake rate (OUR) profiles from the sodium acetate degradation process, according two kinetic theories: one considering that microorganisms use the carbon reserve and easily biodegradable substrates simultaneously for growth; and the other that microorganisms use the carbon reserve only when easily biodegradable substrate is depleted. In this study, the first theory proved to be the most adequate to predict the experimental OUR profile. In the second part, the hospital wastewater degradation process simulated using the theory determined as the more suitable. The stoichiometric parameters obtained for acetate were used for the hospital wastewater COD fractionation process, considering simultaneous growth and substrate storage. These COD fractions and the stoichiometric parameters obtained for acetate were employed for the simulation process of hospital wastewater degradation, where only kinetic parameters were calibrated. Good correspondence was obtained between experimental data and the model outputs. The values obtained for kinetic parameters were different from those obtained for sodium acetate, evidencing the influence of the substrate nature. Through the calibration of stoichiometric and kinetic parameters using the proposed procedure, the activated sludge models proved their capacity and usefulness for the simulation of a hospital wastewater degradation process

Keywords: Hospital wastewater; Modeling; Respirometry; Submerged membrane bioreactor; Substrate storage

*Corresponding author.