Enzymatic saccharification of acid pretreated corn stover: empirical and fractal kinetic modelling

Mateusz Wojtusik, Mauricio Zurita, Juan C. Villar, Miguel Ladero, Felix Garcia-Ochoa

PII: S0960-8524(16)31197-X
DOI: http://dx.doi.org/10.1016/j.biortech.2016.08.069
Reference: BITE 16972

To appear in: *Bioresource Technology*

Received Date: 29 June 2016
Revised Date: 16 August 2016
Accepted Date: 17 August 2016

Please cite this article as: Wojtusik, M., Zurita, M., Villar, J.C., Ladero, M., Garcia-Ochoa, F., Enzymatic saccharification of acid pretreated corn stover: empirical and fractal kinetic modelling, *Bioresource Technology* (2016), doi: http://dx.doi.org/10.1016/j.biortech.2016.08.069

ENZYMATIC SACCHARIFICATION of ACID PRETREATED CORN STOVER: EMPIRICAL and FRACTAL KINETIC MODELLING

Mateusz Wojtusik[1], Mauricio Zurita[2], Juan C. Villar[3], Miguel Ladero[*,1], Felix Garcia-Ochoa[1]

[1] Chemical Engineering Deparment, Universidad Complutense de Madrid. Avda. Complutense s/n, 28040 Madrid, Spain

[2]Abengoa Research. Campus de Palmas Altas, 41014 Sevilla, Spain

[3] Laboratory of Cellulose and Paper. INIA.Forest Research Center.Ctra.de la Coruña km 7,5, 28040 Madrid, Spain

ABSTRACT

Enzymatic hydrolysis of corn stover was studied at agitation speeds from 50 to 500 rpm in a stirred tank bioreactor, at high solid concentrations (20% w/w dry solid/suspension), 50 ºC and 15.5 $mg_{protein}\ g_{glucane}^{-1}$. Two empirical kinetic models have been fitted to empirical data, namely: a potential model and a fractal one. For the former case, the global order dramatically decreases from 13 to 2 as agitation speed increases, suggesting an increment in the access of enzymes to cellulose in terms of chemisorption followed by hydrolysis. For its part, the fractal kinetic model fits better to data, showing its kinetic constant a constant augmentation with increasing agitation speed up to a constant value at 250 rpm and above, when mass transfer limitations are overcome. In contrast, the fractal exponent decreases with rising agitation speed till *circa* 0.19, suggesting higher accessibility of enzymes to the substrate.