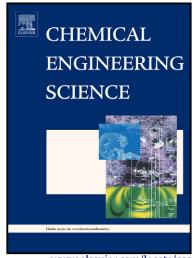
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ACCEPTED MANUSCRIPT

Robust observation strategy to estimate the substrate concentration in the influent of a fermentative bioreactor for hydrogen production

Ixbalank Torres Zúñiga^{a,c}, Alejandro Vargas^{a,*}, Eric Latrille^b, Germán Buitrón^a

^aLaboratory for Research on Advanced Processes for Water Treatment
Unidad Académica Juriquilla, Instituto de Ingeniería, Universidad Nacional Autónoma de México
Blvd. Juriquilla 3001, 76230 Querétaro, Mexico.

^bINRA, UR050, Laboratoire de Biotechnologie de l'Environnement
Avenue des Etangs, Narbonne F-11100, France.

^cFacultad de Ingeniería, Universidad Autónoma de Querétaro, Cerro de las Campanas s/n, 76010 Querétaro,
Mexico.

Abstract

The observation strategy developed in this article consists in an H_{∞} Luenberger observer coupled to a classical super-twisting observer. The H_{∞} Luenberger observer uses the biohydrogen flow rate measured at the reactor output to estimate the glucose and the biomass concentrations inside the reactor. These estimations are taken by the super-twisting observer to estimate the glucose concentration at the reactor input. First, pseudo-stoichiometric and kinetic parameters of the bioreactor model are identified. Two semi-definite optimization problems are then proposed to compute the observer gains. Results show that the biomass is a sensitive state variable. In spite of this, the glucose estimated at the reactor input correctly follows the experimental data and the estimation error remains close to zero in the complete period of time considered.

Keywords: Biohydrogen production, robust estimation, super-twisting observer, Luenberger observer, H_{∞} control.

1. Introduction

The monitoring of processes is a key subject in biotechnological engineering due to the importance of following the state of a set of critical variables. The information obtained from

^{*}Corresponding author

Email addresses: ixbalank@gmail.com (Ixbalank Torres Zúñiga), avargasc@iingen.unam.mx (Alejandro Vargas), eric.latrille@supagro.inra.fr (Eric Latrille), qbuitronm@iingen.unam.mx (Germán Buitrón)

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