



Centre for Bioprocess Engineering Research

University of Cape Town (UCT)

Cape Town, South Africa

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Title:	Optimization of fermentation for bioethanol production from mixed xylose and glucose using immobilized cultures: mathematical model and experimental observation
Abstract:	<p>This research focuses on the study of the production of bioethanol from sugarcane bagasse. In particular, xylose and glucose hydrolyzed from the hemicellulose and cellulose fraction of bagasse in the pretreatment and hydrolysis steps will be fermented in this project. A high and efficient conversion of glucose and xylose is necessary for commercial viability of bioethanol production. In view of the methods presented (e.g. sequential cultures in one and two reactors, co-cultures) for co-fermentation of glucose and xylose, utilizing two different microorganisms (e.g. <i>Zymomonas mobilis</i> and <i>Pichia stipitis</i> for efficient fermentation of the glucose and xylose respectively) is an option. The conversion of glucose and xylose with suspended and immobilized cultures in two reactors in series (<i>Z.mobilis</i> is inoculated in the first reactor to convert glucose rapidly, and a second reactor with <i>P.stipitis</i> to convert xylose) will be modeled from the kinetic results of literature and experimental work. Examples of parameters that will be studied are initial sugar concentration, oxygen flow rates, and dilution rate. The model will be refined with the use of MATLAB. Ultimately, the refined model will be used to determine optimal parameters for maximum ethanol yields and productivity which will, in turn, be validated with experimental work.</p>
Lead institution:	University of Cape Town
Partner institutions:	-
Student name:	Nosaibeh Nosrati Ghods
Supervisor name:	Dr. Siew Tai, Prof. Sue Harrison, Dr. Adeniyi Isafiade
Degree:	PhD
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Start date:	01/01/2014
End date:	31/12/2017
Feedstock:	Xylose and glucose containing digestates of bagasse
Value chain products:	Ethanol
Geographic source of the feedstock:	Eastern South Africa (KwaZulu-Natal, Eastern Cape and Mpumalanga)