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## Textile bioreactor a possible solution to reducing ethanol fermentation cost

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There is growing concern on bioethanol application as a transportation fuel because of the current low price of crude oil. To reduce the ethanol fermentation cost, how ethanol bioreactors can be designed to offer process flexibility, reduced investment cost, optimal productivity and more than  $1 \text{ h}^{-1}$  dilution rates without washout was investigated. A bioreactor made with textile as its backbone material of construction was designed to anaerobically utilize flocculating yeast for ethanol production without using mixing devices like aerators, spargers and stirrers. A mixing system was developed that used the flocculating yeast in the form of a fluidized bed in the bioreactor, and the conditions needed to maintain the fluidized bed in the bioreactor were determined. Recirculation flow rate and utilization of the mixing system were used as process variables for fermentation experiments. It was found that it is possible to use the fluidized mixing system in the bioreactor at dilution rate of  $1.2 \text{ h}^{-1}$  without washout. Mass transfer limitations associated with mixing when using flocculating yeast was resolved even at low recirculation mixing rate of  $0.0016 \text{ VVM}$ . Specific ethanol productivity of  $0.29 \pm 0.01 \text{ g-ethanol/g-biomass/h}$  with complete sucrose consumption was attained. Using the bioreactor with flocculating yeast can reduce the fermentation investment cost of a  $100,000 \text{ m}^3/\text{y}$  ethanol plant by 37%.

### Biography

Osagie A Osadolor has been a PhD student at University of Borås, Sweden since 2014. His PhD thesis is on "Textile Bioreactor Development for Ethanol and Biogas Production". Prior to this, he worked as a Management Trainee at Honeywell Groups, Nigeria and as a Graduate Assistant at University of Benin, Nigeria. He has a Master's degree (MEng with distinction) and a Bachelor's degree (BEng with first class honors) in Chemical Engineering from University of Benin, Nigeria. He has published 2 papers in reputable journals.

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