To Study Yeast Growth Kinetics in a Specially Designed External Loop Airlift Bioreactor

Tapan Kumar Ghosh[1], Debnath Bhattacharyya[2], and Tai-hoon Kim[3]

[1]Heritage Institute of Technology
Kolkata -700107, India.
tapanswatighosh@gmail.com
[2]Hannam University,
Daejeon, South Korea.
[3]University of Tasmania, Australia
debnathb@gmail.com,taihoonn@empal.com

Abstract

Two types of airlift fermenters, conventional (UT-ALF) and modified (CDT-ALF) were investigated to evaluate their performance with respect to baker's yeast growth. The riser tube of conventional external loop airlift fermenter is replaced by a converging-diverging tube. The new reactor is called modified airlift reactor.

The results were compared for the two types of airlift fermenter (UT-ALF and CDT-ALF). Growth rates (dx/dt) were determined from experimental data for both the reactors under identical operating conditions and compared. CDT-ALF always shows higher growth rate compared to UT-ALF under any operating condition. Maximum growth was reported in CDT-ALF at 50 gm/l initial glucose conc. and 1.0 vvm air flow rate which was 20 % higher than UT-ALF. Yield (YX/S) was found to be 0.51which is theoretically very near to maximum achievable value.

Keywords: *Yeast cell, Bioreactor, Growth rate, Airlift fermenter (ALF), Culture, Air flow rate.*

Symbols:

ALF	*Air-lift fermenter*
CDT	*Converging – diverging tube*
UT	*Uniform tube*
KLa	*Volumetric mass transfer coefficient (1/ hr.)*
D.O	*Dissolved oxygen*
DNS	*Dinitrosalicylic acid*
O D	*Optical density*
vvm	*Volume per volume per minute*
dx/dt	*Growth rate*
dmax	*Maximum dx/dt*
tmax	*Time to achieve dmax*

1. Introduction

Oxygen supply is a critical factor for many aerobic fermentation processes [1]. Initial glucose concentration in batch culture is another crucial parameter which control cell mass