Yeast-activated sludge model for aerobic degradation of a non-fermentable substrate

Matthew Dubois Frigona,*, Dongfang Lia, James Youngb

aCollege of Environmental Science and Engineering, Nankai University, 94 Weijin Road, Tianjin 300071, China, Tel. +001 678 938 7521; emails: mfrigon@newfields.com (M.D. Frigon), 13752092530@163.com (D. Liu)
bProfessor of Environmental Engineering (Retired), University of Arkansas, Fayetteville 72701, AR, USA, email: jcyen@msn.com

Received 21 July 2015; Accepted 19 November 2015

ABSTRACT

This paper uses a combination of models and unique features not found in other models to develop a yeast-activated sludge model for modeling yeast kinetics while degrading an aerobic, non-fermentable substrate. Respirometry is used in conjunction with carbohydrate testing to determine model parameters and kinetics for yeast-activated sludge consuming glycerol at 30 g/l salinity. The data and model show that yeast metabolism begins with exponential growth similar to bacteria. After a minimum substrate level is reached, metabolism switches to storage/consumption of stored material. This phase is followed by a decay phase that is characterized by consumption of a portion of the material stored in the yeast cells. Values for kinetic parameters of the model are provided after fitting the model to four different substrate concentrations. Through the model, the differences between operation of bacterial and yeast systems become apparent and are explained.

Keywords: Yeast; Respirometry; Kinetics; Wastewater treatment; High salinity wastewater treatment

*Corresponding author.

1944-3994/1944-3986 © 2015 Balaban Desalination Publications. All rights reserved.