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PII: S2589-014X(18)30005-7
DOI: https://doi.org/10.1016/j.biteb.2018.01.005
Reference: BITEB 6

To appear in:

Received date: 3 January 2018
Revised date: 21 January 2018
Accepted date: 22 January 2018

Please cite this article as: Elliot Mallen, Vesna Najdanovic-Visak , Brewers' spent grains: Drying kinetics and biodiesel production. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Biteb(2017), https://doi.org/10.1016/j.biteb.2018.01.005

Brewers' Spent Grains: Drying Kinetics and Biodiesel Production

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Abstract

Enormous amounts of brewers' spent grains (BSGs) per year are generated to produce bear worldwide. BSGs can be used as a carbon source, biofuel to generate energy and as a source of biogas. Typically, BSGs contain more than 60 mass% of water and, therefore, drying kinetics is a paramount for the development of any of these valorisation processes.

In this work, we reveal the main parameters and mechanism of drying kinetics of BSGs at isothermal conditions (60^{o}C-90^{o}C), measured by thermogravimetric analysis. Diffusion coefficients ranged from 1.42×10^{-9} m^2s^{-1} to 2.67×10^{-9} m^2s^{-1} while the activation energy was 26.6 $kJmol^{-1}$.

Furthermore, for the first time, biodiesel production from BSGs is reported. We employed acid catalysed in situ transesterification process, at different catalyst concentrations, methanol to BSGs ratios, reaction time and temperature.

The outcomes of our study show promise for alternative valorisation of brewers' spent grains, an abundant waste spread around the world.

Keywords: Thermogravimetric analysis (TGA); In situ transesterification; Drying mechanisms; Reactive extraction.