

Author's Accepted Manuscript

Micromechanical modelling of oil palm empty fruit bunch fibres containing silica bodies

Farah Nadia Omar, Suhaiza Hanim Hanipah, Loo Yu Xiang, Mohd Afandi P. Mohammed, Azhari Samsu Baharuddin, Jaafar Abdullah



PII: S1751-6161(16)30116-3
DOI: <http://dx.doi.org/10.1016/j.jmbbm.2016.04.043>
Reference: JMBBM1910

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 14 December 2015
Revised date: 4 April 2016
Accepted date: 29 April 2016

Cite this article as: Farah Nadia Omar, Suhaiza Hanim Hanipah, Loo Yu Xiang, Mohd Afandi P. Mohammed, Azhari Samsu Baharuddin and Jaafar Abdullah, Micromechanical modelling of oil palm empty fruit bunch fibres containing silica bodies, *Journal of the Mechanical Behavior of Biomedical Materials* <http://dx.doi.org/10.1016/j.jmbbm.2016.04.043>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Micromechanical modelling of oil palm empty fruit bunch fibres containing silica bodies

Farah Nadia Omar¹, Suhaiza Hanim Hanipah^{1,2}, Loo Yu Xiang¹, Mohd Afandi P
Mohammed^{1*}, Azhari Samsu Baharuddin¹, Jaafar Abdullah³

¹Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra
Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

²Faculty of Chemical Engineering, Universiti Teknologi MARA, 40450 Shah Alam,
Selangor, Malaysia.

³Centre of Computed Tomography and Industrial Imaging, Malaysia Nuclear Agency, 43000
Bangi, Selangor, Malaysia.

Email: afandi@upm.edu.my; phone: +603894643141; fax: +60389464440

Abstract

Experimental and numerical investigation was conducted to study the micromechanics of oil palm empty fruit bunch fibres containing silica bodies. The finite viscoelastic-plastic material model called Parallel Rheological Network model was proposed, that fitted well with cyclic and stress relaxation tensile tests of the fibres. Representative volume element and microstructure models were developed using finite element method, where the models information was obtained from microscopy and x-ray micro-tomography analyses. Simulation results showed that difference of the fibres model with silica bodies and those without ones is larger under shear than compression and tension. However, in comparison to geometrical effect (i.e. silica bodies), it is suggested that ultrastructure components of the fibres (modelled using finite viscoelastic-plastic model) is responsible for the complex mechanical behaviour of oil palm fibres. This can be due to cellulose, hemicellulose and lignin components and the interface behaviour, as reported on other lignocellulosic materials.

Keywords: finite-element-micromechanics, silica-body-fibre-interface, x-ray-micro-tomography

Abbreviations: ADF: Acid detergent fibre, ADL: Acid detergent liquid, ATR: Attenuated total reflectance, CZM: Cohesive zone model, CW: Cell wall, FTIR: Fourier Transform infrared, NDF: Neutral detergent fibre, OPEFB: Oil palm empty fruit bunch, PRN: Parallel

Download English Version:

<https://daneshyari.com/en/article/7207788>

Download Persian Version:

<https://daneshyari.com/article/7207788>

[Daneshyari.com](https://daneshyari.com)