

Accepted Manuscript

Statistical validation of individual fibre segmentation from tomograms and microscopy

Monica Jane Emerson, Vedrana Andersen Dahl, Knut Conradsen, Lars Pilgaard Mikkelsen, Anders Bjorholm Dahl



PII: S0266-3538(18)30039-3

DOI: [10.1016/j.compscitech.2018.03.027](https://doi.org/10.1016/j.compscitech.2018.03.027)

Reference: CSTE 7145

To appear in: *Composites Science and Technology*

Received Date: 20 January 2018

Revised Date: 18 March 2018

Accepted Date: 19 March 2018

Please cite this article as: Emerson MJ, Dahl VA, Conradsen K, Mikkelsen LP, Dahl AB, Statistical validation of individual fibre segmentation from tomograms and microscopy, *Composites Science and Technology* (2018), doi: 10.1016/j.compscitech.2018.03.027.

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 proof before it is published in its final 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.

Statistical Validation of Individual Fibre Segmentation from Tomograms and Microscopy

Monica Jane Emerson^a, Vedrana Andersen Dahl^a, Knut Conradsen^a, Lars Pilgaard Mikkelsen^b and Anders Bjorholm Dahl^a

^a*Department of Applied Mathematics and Computer Science, Technical University of Denmark.*

^b*Department of Wind Energy, Technical University of Denmark.*

Abstract

Imaging with X-ray computed tomography (CT) enables non-destructive 3D characterisations of the micro-structure inside fibre composites. In this paper we validate the use of X-ray CT coupled with image analysis for characterising unidirectional (UD) fibre composites. We compare X-ray CT at different resolutions to optical microscopy and scanning electron microscopy, where we characterise fibres by their diameters and positions. In addition to comparing individual fibre diameters, we also model their spatial distribution, and compare the obtained model parameters. Our study shows that X-ray CT is a high precision technique for characterising fibre composites and, with our suggested image analysis method for fibre detection, high precision is also obtained at low resolutions. This has great potential, since it allows larger fields of view to be analysed. Besides analysing representative volumes with high precision, we demonstrate that based on our methodology for individual fibre segmentation it is now possible to study complete bundles at the fibre scale and reveal inhomogeneities in the physical sample.

Keywords: Geometrical characterisation A. Polymer-matrix composites (PMCs) A. Glass fibres C. Statistics D. Non-destructive testing

*Monica Jane Emerson (monj@dtu.dk). Technical University of Denmark, Richard Petersens Plads, Building 324, 2800 Kgs. Lyngby, Denmark.

Download English Version:

<https://daneshyari.com/en/article/7214502>

Download Persian Version:

<https://daneshyari.com/article/7214502>

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