

Accepted Manuscript

Effect of strain rate on mechanical properties of the bamboo material under quasi-static and dynamic loading condition

Dayong Hu, Bin Song, Linwei Dang, Zhiqiang Zhang

PII: S0263-8223(17)33963-6

DOI: <https://doi.org/10.1016/j.compstruct.2018.05.107>

Reference: COST 9746

To appear in: *Composite Structures*

Received Date: 28 November 2017

Revised Date: 20 April 2018

Accepted Date: 18 May 2018



Please cite this article as: Hu, D., Song, B., Dang, L., Zhang, Z., Effect of strain rate on mechanical properties of the bamboo material under quasi-static and dynamic loading condition, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.05.107>

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.

Effect of strain rate on mechanical properties of the bamboo material under quasi-static and dynamic loading condition

Dayong Hu^{1,2}, Bin Song¹, Linwei Dang¹, Zhiqiang Zhang^{3,4*}

¹*Department of Aircraft Airworthiness Engineering, School of Transportation Science and Engineering, Beihang University, Beijing, China, 100191*

²*Aircraft/Engine Integrated System Safety Beijing Key Laboratory, Beijing, China, 100191*

³*Key Laboratory of Rehabilitation Technical Aids Analysis and Identification of the Ministry of Civil Affairs, National Research Center for Rehabilitation Technical Aids, Beijing, China, 100176*

⁴*Beijing Key Laboratory of Rehabilitation Technical Aids for Old-Age Disability, Beijing, China, 100176*

Abstract

As a kind of fiber-reinforced bio-composite, bamboo material exhibits superior mechanical performance. In present work, quasi-static and dynamic Split Hopkinson Pressure Bar (SHPB) compression experiments at the nominal strain rate range of $500 \text{ s}^{-1} \sim 2200 \text{ s}^{-1}$ were carried out to investigate the effect of strain rate on mechanical behaviors of the bamboo material. In consideration of the effect of fiber directions on mechanical behaviors, the specimens were crushed with the loading direction parallel to the fiber longitudinal direction and perpendicular to the fiber direction, respectively. The experiments under both loading directions exhibited remarkable strain rate sensitivity. The yield stress for the specimens crushed along the fiber longitudinal direction increased from 38.59 MPa to 94.25 MPa, as the strain rate varied from 1.85×10^{-3} to 2200 s^{-1} , while it increased from 7.18 MPa to 42.04 MPa for the specimens crushed perpendicularly to the fiber direction. Final deformation photographs and scanning electron micrographs of the bamboo microstructures clearly illustrated their damage morphologies and various failure mechanisms, including fiber buckling, fiber fractures, PCs collapse, delamination and crack propagation at different strain rates and loading directions. These results may provide

* Corresponding author: Dr. Zhiqiang Zhang, E-mail: zhangzhiqiang@nrcrta.cn

Download English Version:

<https://daneshyari.com/en/article/6703201>

Download Persian Version:

<https://daneshyari.com/article/6703201>

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