Experimental and theoretical assessment of flexural properties of hybrid natural fibre composites

The concept of hybridization of natural fibre composites with synthetic fibres is attracting increasing scientific attention. The present study addresses the flexural properties of hybrid flax/glass/epoxy composites to demonstrate the potential benefits of hybridization. The study covers both experimental and theoretical assessments. Composite laminates with different hybrid fibre mixing ratios and different layer configurations were manufactured, and their volumetric composition and flexural properties were measured. The relationship between volume fractions in the composites is shown to be well predicted as a function of the hybrid fibre mixing ratio. The flexural modulus of the composites is theoretically assessed by using micromechanical models and laminate theory. The model predictions are compared with the experimentally determined flexural properties. Both approaches show that the flexural modulus of the composites is consistently increased when the flax fibre fabrics are replaced by glass fibre fabrics from the inner layers to the outer layers. The observed deviations between the experimental and theoretical values are explained by the simplifying model assumptions applied for the configuration of the composites, in particular the flax fibre composites. This needs to be addressed in further work.

General information
Publication status: Published
Organisations: Department of Wind Energy, Composites Mechanics and Materials Mechanics
Contributors: Raghavalu Thirumalai, D. P., Toftegaard, H. L., Markussen, C. M., Madsen, B.
Pages: 2775-2782
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Acta Mechanica
Volume: 225
Issue number: 10
ISSN (Print): 0001-5970
Ratings:
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.68 SJR 0.94 SNIP 1.186
Web of Science (2014): Impact factor 1.465
Web of Science (2014): Indexed yes
Original language: English
DOIs:
10.1007/s00707-014-1210-5
Research output: Contribution to journal › Conference article – Annual report year: 2014 › Research › peer-review