



Advanced High Strength Natural Fibre Composites in Construction

Edited by Mizi Fan and Feng Fu

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Edited by

Mizi Fan

Feng Fu



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Preface

The modern construction industry is subject to a period of dramatic policy shift and to a priority change from a profit-charged business machine to a socioeconomic and environmentally driven organism. The environmental impact of the construction industry has been the subject of much scrutiny for the past few decades. Energy consumption in use and the construction of buildings account for about 40% of total CO₂ emissions, 15% of which can be attributed to the production of construction materials. The global target of halving CO₂ emissions from industries, along with projections for the demand of materials to double by 2050, means a fourfold reduction in emissions per unit of material used. The expected energy efficiency targets of new buildings will cast the embodied impact of materials into sharp relief. It is therefore crucial that the embodied impact of construction materials is addressed and that new materials in development support the realization of environmental aspirations from the construction industry.

Advanced composite materials are becoming established as a staple in all structures, driving a multibillion dollar market internationally. There has been a growing movement to utilise biomass in the face of climate change, demands for sustainable economic growth and uncertain energy supplies. A typical biomass resource is wood and other natural fibre-based composite products, the raw material of which is a resource that is converted from CO₂ (in the atmosphere) through photosynthesis using solar energy, and can provide a renewable and sustainable raw material source. The first division of biomass-based composites defined as being suitable for construction is particle- or fibre-based composites, known as wood itself as a polymer composite and wood-based composites; the second of these divisions is long natural fibre composites being seen as an alternative to synthetic fibre composites; the third division is the one that is soon likely to have uses in construction, nanocellulose or nanotechnology-enhanced biobased composites; the fourth division of these construction composites is laminated composites.

The use of biomass-based products in construction, which facilitates the reduction of environmental impact, for engineering has a direct influence on human life, affecting in many ways the people involved and producing wider ripple effects in many related and non-related fields in the community. The safe and sustainable use of materials in construction necessitates that the natural fibre composites are fit for purpose and that their life-cycle performance can be determined with sufficient accuracy. Ever-changing demands for better products remain a constant challenge, while the facilitation of the market introduction of new products and conformity assessment becomes the foremost difficulty facing the natural fibre composites industry.

The main objective of this book is to provide the basic framework and knowledge required for the efficient and sustainable use of natural fibre composites as a structural and building material, and to improve the efficiency of use and competitiveness of the composites. The book presents vital issues, and is effective and instructive for a mutual understanding of the nature and behaviour of high-strength natural fibre composites in construction. It will serve as a valuable text or reference book challenging academics, research scholars and engineers to think beyond standard practices when designing and creating novel construction materials.

Mizi Fan

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