

Natural fibre composites; Recent developments

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Abstract

Natural fibres offer various well documented advantages such as low carbon footprint, good specific mechanical properties, low abrasiveness and some technical characteristics like good acoustic and structural damping, combined with moderate cost. Research at KU Leuven is focusing on some of their shortcomings such as low moisture resistance, limited off-axis mechanical properties, limited adhesion with certain matrices and processing related issues. Also, research is directed towards developing bio-based matrices.

An overview will be given of recent research results. An integrated physical-chemical-micromechanical approach was developed to study the fibre-matrix interface. Fibre treatments or matrix modifications are selected based on this analysis. A novel sequence of processes was developed to first extract long bamboo fibres from the bamboo culm and subsequently to clean these fibres from superfluous parenchyma tissue. In a next step, continuous bamboo fibre prepreg tape will be developed. It was shown that the effect of moisture on bamboo fibre properties is limited. For flax fibre composites, it was confirmed that yarn twist and fabric crimp together cause a large reduction in composite stiffness and strength and actions have been undertaken with the flax fibre producers to deliver preforms with straight fibres to the composite industry. Modified gluten biopolymers have been prepared with stiffness and strength comparable to epoxy resin and composites were prepared with flax and bamboo fibres, showing decent adhesion. A new project aims at characterisation of new hemp varieties.

Key words: Natural fibres; Surface analysis; Fibre processing; Biopolymers