Characterisation and prediction of the long-term behaviour of Plant Fibre Composites for semi-structural applications

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In recent years, due to increasing environmental concerns, there has been a growing renewal of interest in fibres from lignocellulosic feedstock. In addition to their historical and traditional applications, mainly in the textile, pulp and paper industries, new opportunities have emerged for plant fibres. Thanks to outstanding research efforts, this resource has become an attractive material for engineering applications. Nowadays, plant fibre composites (PFCs) used for non-structural components (for the construction, insulation, automotive and plastic industries) represent the biggest share of this growing market. In this type of products, plant fibres are used in the form of short fibres or non-woven reinforcement. They are being employed primarily as light, cheap, and eco-friendly reinforcement playing only little or no structural role. Considering their high mechanical performance, the next step is to attract industrial interest towards the use of plant fibres in load-bearing materials.
However one of the main barriers that still remains to be knocked down concerns their durability. Indeed, for some intended applications, PFCs will be heavily exposed to moisture, various temperatures and UV radiations in addition to static, cyclic and dynamic mechanical loadings. These environmental loadings can strongly affect their mechanical properties and therefore play a critical role in the service life of PFCs.
This presentation will be focused on recent works done in our research team to predict the long-term behaviour of unidirectional PFCs. A particular emphasis will be put on the characterisation of the influence of moisture on the static, cyclic and dynamic behaviour of a flax fibre reinforced epoxy polymer.