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Mechanical characterisation and adhesive joints with natural fibre composites

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Natural fibre composites have recently gained interest and application, for instance in the construction industry, due to a few desirable properties such as low cost and density, less machining wear during fabrication, no health hazards, biodegradability and availability from natural and renewable sources [1]. As for limitations of natural fibres as reinforcement, the specific stiffness and strength does not match high strength artificial fibres, and their hollow nature may affect acoustic insulation or damping properties in certain types of matrices. Natural fibres like flax, henequen, sisal, coconut, jute, palm, bamboo, wood, paper, as well as several waste cellulosic products such as shell flour, wood flour and pulp have been used as reinforcement in thermosetting and thermoplastic resin composites [2]. To expand the application of adhesive joints between natural fibre adherends, its strength and failure mechanisms must be completely understood. In this work, the behaviour of polyester and epoxy resins in traction, and the behaviour of jute natural fibre composites with the same type of resins in traction and bending, were characterized. Testing of the jute composites with the two matrix systems allowed selecting the most suited one, which depended not only on the strength but on the wettability to the jute fibre weaves. The behaviour of single lap adhesive joints using these composites was also characterized, with different adhesives and different overlap lengths, to examine the strength of the joints and the types of failure.

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