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An important research focus in the field of "Biological Materials" is the development of sustainable materials along the value added chain from the raw materials production to the final product in combination with biomimetic aspects. For example we are looking for structures in nature which display very good specific properties and transfer them in an abstracted form into a technical composite. In this way the petioles of red rhubarb taught us a structural construction for the improvement of the impact characteristics of technical fibre reinforced composites.

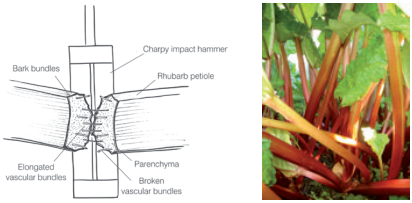


Figure 1: Fracture mechanism of a rhubarb petiole during impact testing

For the production of the bio-inspired composites we try to use materials produced from renewable resources like cellulose fibres as reinforcement and biodegradable polymers.

The main research activities are as follows:

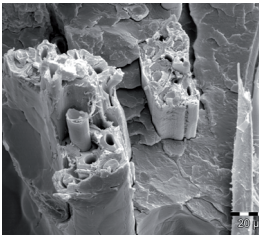
- Development of concepts for sustainable materials
- Relation of structure and properties in materials
- Bio-inspired materials & insulation products
- Natural fibres and natural fibre reinforced composites
- Adhesion and interfaces

Services:

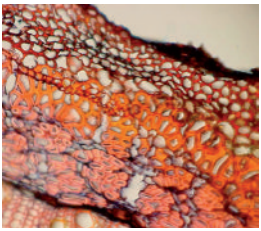
- Material & product development
- Material testing
- Research Co-operation
- Research Assignment

Equipment:

- Characterization of fibres: (i) bending and tensile testing, (ii) image analysis - fineness & length and (iii) cross section measurement with laser technique.
- Characterization of composites & polymers: (i) tensile, bending & compression tests, (ii) torsion test, (iii) Charpy, Izod & falling dart impact test, (iv) determination of fibre content, (v) melt-flow index and (vi) UV degradation test.
- Investigation of fibre/matrix interactions: (i) pull-out test, (ii) single fibre fragmentation test and (iii) peel test.
- Surface and morphological characterisation: (i) microscopy, (ii) scanning electron microscopy (SEM) and (iii) atomic force microscopy (AFM).
- Lab-scaled fibre and composite processing: (i) stem decortication, (ii) fibre separation, (iii) carding, (iv) compound development and (v) pultrusion.



SEM micrograph:
fracture surface of kenaf fibre reinforced PLA



Cross sectional view of a hemp stalk