Controlled retting of hemp fibres: Effect of hydrothermal pre-treatment and enzymatic retting on the mechanical properties of unidirectional hemp/epoxy composites

The objective of this work was to investigate the use of hydrothermal pre-treatment and enzymatic retting to remove non-cellulosic compounds and thus improve the mechanical properties of hemp fibre/epoxy composites. Hydrothermal pre-treatment at 100 kPa and 121 °C combined with enzymatic retting produced fibres with the highest ultimate tensile strength (UTS) of 780 MPa. Compared to untreated fibres, this combined treatment exhibited a positive effect on the mechanical properties of hemp fibre/epoxy composites, resulting in high quality composites with low porosity factor (αpf) of 0.08. Traditional field retting produced composites with the poorest mechanical properties and the highest αpf of 0.16. Hydrothermal pretreatment at 100 kPa and subsequent enzymatic retting resulted in hemp fibre composites with the highest UTS of 325 MPa, and stiffness of 38 GPa with 50% fibre volume content, which was 31% and 41% higher, respectively, compared to field retted fibres.

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