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F. Bensadoun, D. Depuydt, J. Baets, I Verpoest, A.W. Van Vuure

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## LOW VELOCITY IMPACT PROPERTIES OF FLAX COMPOSITES

F. Bensadoun<sup>1</sup>, D. Depuydt<sup>1</sup>, J. Baets<sup>1</sup>, I Verpoest<sup>1</sup>, A.W. Van Vuure<sup>1</sup>

<sup>1</sup> KU Leuven - Department of Materials Engineering, Kasteelpark Arenberg 44 - bus 2450, 3001 Heverlee,  
Belgium

\*Corresponding author: [ignaas.verpoest@kuleuven.be](mailto:ignaas.verpoest@kuleuven.be)

### ABSTRACT

The investigation of the impact performance of flax-based composites is the key in order to understand which material parameters determine the safety and longevity of flax composite products. In this study, the effect of fibre architectures and matrix type on the absorbed energy after perforation, on the damage resistance as well as on the residual properties after impact were investigated. The matrix choice (epoxy vs MAPP) was found to greatly influence the absorbed energy as well as the damage area. The absorbed energy at perforation for the flax-MAPP composite was more than 50% higher compared to the flax-epoxy composites. Overall, the type of architecture has been found to have a limited effect on the absorbed energy at perforation. Furthermore, the use of a ductile thermoplastic matrix results in a decreased impact damage area by 38% to 59% with little delamination growth. The flax-epoxy composites experienced a stronger decrease in properties after impact, however these quasi-static properties are still much higher than the flax-MAPP composites.

Keywords: fibre architecture, matrix, flax fibres, damaged area, absorbed energy

### 1. INTRODUCTION

Impact damage, especially at low velocity, is commonly recognised as one of the most severe threats to composite structures. Therefore, a good understanding of the impact behaviour of composite structures is crucial for the design process. Impact properties cover three aspects, and can be measured in three ways: energy absorption after perforation impact tests, damage resistance (damage area after non-perforation impact) and damage tolerance (residual properties after non-perforation impact) [1]. Impact properties are influenced by many factors such as: matrix type, matrix ductility, fibre type, fibre architecture, fibre orientations, fibre-matrix interface quality, laminate thickness and stacking sequence as well as the interlaminar fracture toughness. Physical factors such as the panel geometry and its dimensions, constraint conditions and the impactor geometry should also be considered [2].

#### 1.1 Low velocity impact damage

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