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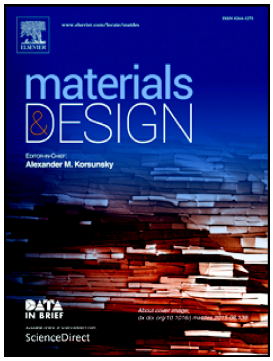

Flax fiber-reinforced composite lattice cores: A low-cost and recyclable approach

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Flax fiber-reinforced composite lattice cores: a low-cost and recyclable approach

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Abstract

Lightweight, low cost, and recyclability are priorities in various material selections. In this study, flax fiber-reinforced lattice cores with redesigned lattice geometry were developed and manufactured by vacuum-assisted resin infusion and slot assembly method. An orthotropic constitutive model of the redesigned lattice cores was proposed, and the elastic compliance matrix was expressed with lattice geometry and properties of parent materials. Then, lattice structures with composites and foam sandwich trusses were fabricated and compressed, respectively. Specific nominal stiffness and strength values of the latter were approximately 1.5× and 2× those of their monolithic counterparts. Subsequently, mechanical property sensitivity of defects formed during processing was simulated, and the results provided additional insights to optimize the lattice design. A property-cost chart was specially created, and flax fiber-reinforced lattice cores proved to be promising candidates for automotive lightweight industry because of their economy and recyclability.

Keyword: Flax fiber; Lattice material; Constitutive model; Mechanical property; Defect sensitivity; Cost

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