Performance of Multi-Composite Materials with Corrugated and Cell Geometries Under Low-Velocity Impact

Master's Thesis Defense in Mechanical Engineering
California Polytechnic State University San Luis Obispo

Presented by Lukas Kolbl
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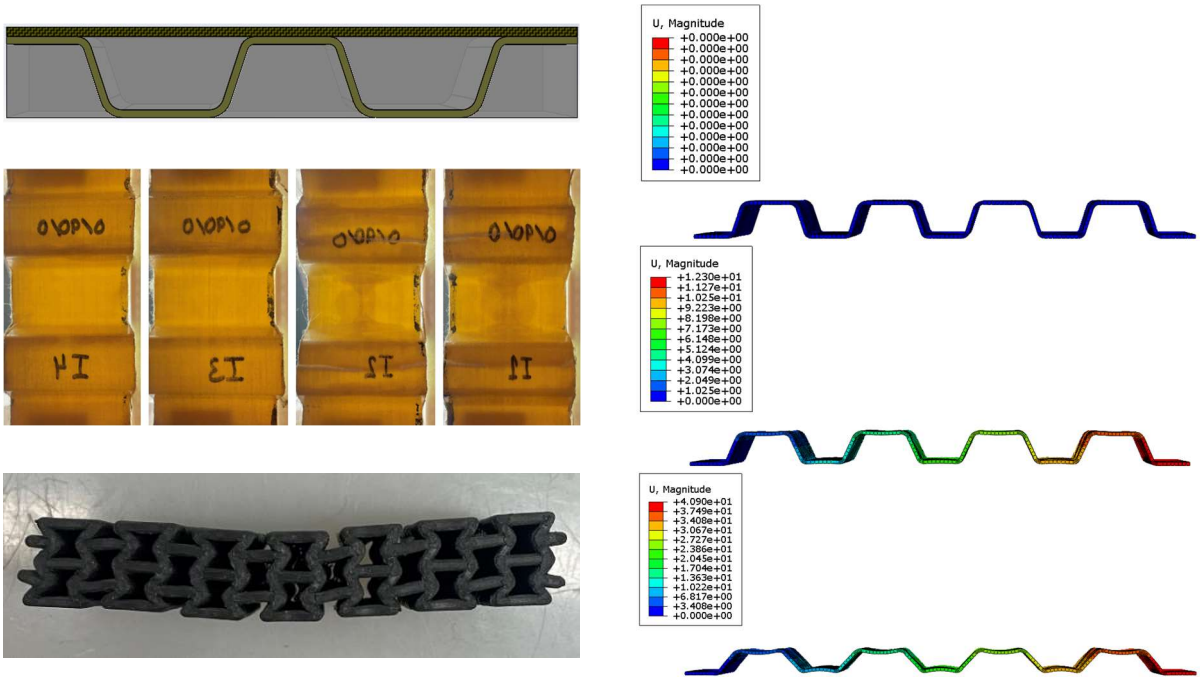

Multi-composite materials with corrugated and cell geometries were incorporated into core-face sheet assemblies that aimed to increase the impact resistance of protective systems. Corrugated cores were manufactured by compression molding prepreg Twaron, using 12 stacking sequences that varied in fiber orientation and laminate thickness. Honeycomb and auxetic cell cores were 3D printed with a Markforged Mark Two printer using continuous Kevlar reinforced Onyx. These structures were subjected to a controlled drop-weight impact event using a Dynatup 8250 impactor and the resulting damage & residual strength were evaluated. In-plane mechanical testing of the base materials and cores was performed on an Instron 8801 to characterize their behavior. Classic Laminate Plate Theory was employed to predict effective engineering constants for selected laminates and a finite element model was developed within Abaqus using continuum shell elements to simulate the in-plane response.

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