Expanding the Composite Manufacturing Process through Folding (2017-050)

Composite Fiberglass-Reinforced Plastics Fabricated by Folding to Allow for Complex Structures

Market Overview

This manufacturing approach for fiberglass-reinforced plastic composites allows fabrication of plastic structures without the use of molds. The global fiberglass product market is estimated to be worth $4.88 billion by 2021 with a CAGR of 6%. Molds are extremely advantageous for producing repeating plastic composite designs, but are not adaptable to manufacturing idiosyncratic structures. In many architectural applications, detailed composite structures are required for the complex design of new ideas, but it is not economical for unique parts to be made through a molding process. Therefore, there is need for a new development process of custom composite designs. Clemson University researchers have developed a new sequential manufacturing methodology for fabricating unique composite structures without the use of molds. The process involves applying resin to certain portions of fiberglass cloth, with the resin-less portions allowing the surfaces to fold. The folds allow for the materials to be easily shipped and can be fully assembled by applying resin to the seams.

Technical Summary

This method involves selectively coating flat sheets of fiberglass with resin by covering the hinge points with tape. This process allows sections of the panels to harden with resin, while the sections without the coating remain pliable. The flexible seams function as fabric hinges that enable panels to fold into complex 3-dimensional shapes. Once the structure has been positioned at the project site, resin is applied at the hinges to reinforce its shape. This fiberglass-reinforced fabrication process is the first of its type to eliminate the traditional mold-making method by applying these folding techniques.

Application

Construction Science; architecture

Development Stage

Pilot-scale studies

Advantages

- Selectively coating flat sheets of fiberglass with resin, eliminating the time and additional cost associated with traditional mold-making
- Generates rigidity while retaining its lightness as a sheet material, increasing the load-carrying capacity of the material
- Structure creases to flatly fold for transportation to the project site, decreasing cost and difficulty of shipping

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Provisional	United States	62/655,978	NA	2017-050	Joseph Choma Brain Leounis

About the Inventors

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Joseph Choma completed his graduate studies in Design and Computation and Bachelor of Science in Architecture Studies at the Massachusetts Institute of Technology. He is the author of Morphing: A Guide to Mathematical Transformations for Architect and Designers and Etudes for Architects as well as the founder of the Design Topology Lab. His current research pursues the physical realization of mathematically defined structures and the advancement of design pedagogy through computational thinking.

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