

**Material Science: Fabric/Textiles**

**Title:** *Structured Flock Fiber Reinforced Layer*

**UMD15-01**

**Inventors:** *Yong Kim, et al.*

**Applications:** Fabrics with enhanced impact resistance for use in sports equipment, body armor, and other applications.

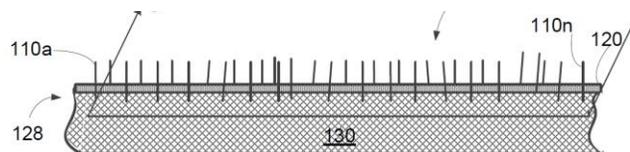
**Benefits:** Materials of the invention have the following benefits:

- Dramatically improved interlaminar shear strength and impact resistance
- Enhanced impact toughness
- Improved transmission properties (electrical and thermal conduction).

**Technology Description:**

Layered fabric-reinforced composites are being increasingly sought for use in impact resistance materials (e.g. body armor, sports equipment). However, such materials generally have the structural drawback of poor interlaminar shear strength, with little or no fiber reinforcement in the thickness (Z-axis) direction. Existing techniques to increase interlaminar strength of layered composite materials are difficult to implement on a commercial level for a number of reasons (cost, time, manufacturing difficulties, etc.). This problem can be overcome by creating a “reinforcement zone” between laminar layers by the flocking of short Z-Axis reinforcing fibers onto individual resin-impregnated fibrous layers such as woven fabric. The present invention incorporates an improvement in which the materials are “pre-flocked” with Z-Axis reinforcing fibers. The new method differs from the inventors’ earlier patented method ([U.S. Patent No. 7,981,495, UMD07-03](#)) by applying only a thin layer of resin to the substrate that is to be flocked, allowing the flocked fibers to penetrate more deeply into the fabric substrate to provide greater durability and stability. Because of these features, these “pre-flocked” fibrous entities (woven, knitted, mat, nonwoven or “pre-pregs”) can be provided to consumers as “off-the-shelf”, flock-reinforced, dry to the touch, pre-manufactured, storable, inventoried organic polymer composite reinforcement materials that are ready as needed to be laid-up and impregnated with matrix resin and cured.

**Patent Status:** The invention is the subject of a pending U.S. patent application.



A dry substrate structured flock fiber reinforced layer produced according to the invention.

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