

**Material Science: Fabric/Textiles**

**Title:** *Flexible, fibrous energy managing composite panels (UMD13-05; 14-01; 14-02)*

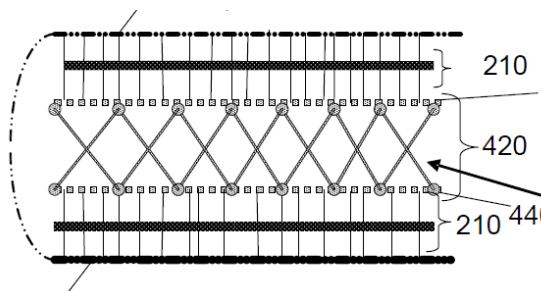
**Inventors:** *Armand Lewis et al.*

**Applications:** New fibrous energy absorbing materials (FEAM) for use in all types of sports and military helmets, padding, vests, and similar gear.

**Benefits:** These materials are lightweight, low cost, and customizable, with the ability to blunt impacts effectively and to spring back instantaneously, while offering breathable comfort.

**Technology Description:** This invention is an improvement over the basic FEAM (fibrous energy absorbing material) technology disclosed in invention UMD12-04, and provides improved materials for use in sports and military helmets, padding, vests, and other clothing and equipment. The original FEAM concept comprises panels in which many short fibers are attached (“flocked”) at one end to a substrate, so that the closely-packed fibers extend away from the substrate in an essentially perpendicular manner. The present invention features different combinations of multiple FEAM layers and fabric, sheet, film, spacer fabric and foam dividers, which form very effective, flexible, fibrous energy managing composite panels. The improvements make use of a synergistic effect that has been discovered in some FEAM/spacer fabric and FEAM/foam embodiments. The materials of this invention can be used to enhance existing sports/military helmet energy absorption systems (e.g. making use of foam layers). The material blunts impact like an airbag. FEAM operates as a flexible ‘spacer’ fabric; worn between the helmet or armor and the body surface providing a broad, spring-like compressible air space. FEAM performance can be customized based on fiber denier and length used in construction. FEAM materials can serve as a breathable liner, a layer inside existing cranial and body protection garments such as football, hockey, baseball, bicycle and skateboarding helmets and body armor. This new fibrous material could also provide other body padding like shin, elbow and knee pads. FEAM elements can be effectively enveloped in fabric to provide a complete stand-alone energy-absorbing pad configuration or adhered to existing padding.

**Patent Status:** This technology is the subject of a pending PCT patent application.



The Figure shows a schematic diagram of one embodiment of the invention, comprised of a spacer fabric layer divider and a FEAM layer with an outer wrapping fabric.

**For more information:** David J. Glass, Ph.D.  
 Technology Transfer Consultant  
 University of Massachusetts Dartmouth  
 UMass office: 508-910-9815  
 Cell: 617-653-9945  
[dglass@umassd.edu](mailto:dglass@umassd.edu)

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