TECHNOLOGY

PBA-Grafted Carbon Nanotube Soft Body Armor

OVERVIEW

Background
The main purpose of body armor is to slow down and blunt the bullet before it reaches the wearer. Hard body armor is composed of ceramic plates inserted into a fabric vest and is used to stop higher caliber rounds. Such vests are heavy and their reusability is low. Soft body armor is made up of layers of flexible Kevlar fabric sewn into a vest and is used as a lightweight protection when feasible. Since it takes 20 to 50 layers of Kevlar to stop a lower caliber bullet, the vest loses its flexibility as a result. This is a disadvantage in applications where agility is required. Combat soldiers carry in excess of 100 pounds of equipment and supplies on average. While this weight slows a soldier down considerably, heavy and bulky body armor reduces speed and flexibility even more.

Innovative Technology
Researchers at the University of Maryland improved the strength of the Kevlar fibers through the addition of an embedded network of cross-linked carbon nano-tubes (CNT). The fabricated ballistic panel with 15 layers of modified Kevlar fabric was tested in a ballistics lab and the results indicated that CNT modification enhanced ballistic resistance of Kevlar fabric by twofold, based on measurements of back face deformation. Additionally, the mechanical properties of the modified Kevlar 29 Style 745 and KM2 Ballistic Fabric were determined through tensile testing. The tensile strengths increased from 94.7 MPa to 443 MPa and 142 MPa to 213 MPa, respectively. The new material allows military grade soft body armor vests to be scaled down in thickness, thus increasing wearers' flexibility and range of motion. Alternatively, the same vest size will provide greater protection from projectiles. In either case, the new material offers greater protection to service personnel, thus saving lives and reducing the amount of serious injuries inflicted by projectiles.

APPLICATIONS

Body armor
Composite materials for high strength applications
Impact absorbers or dampers
Conductive composites

ADVANTAGES

Extended time of interaction between bullet and each Kevlar layer
Reduction of number of layers in the soft body armor vest
Potential replacement for hard body armor
Reduced body armor weight
Improved flexibility of body armor

CONTACT INFO

UM Ventures
0134 Lee Building
7809 Regents Drive
College Park, MD 20742
Email: umdtechtransfer@umd.edu
Phone: (301) 405-3947 | Fax: (301) 314-9502

Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Pending

EXTERNAL RESOURCES

PS-2015-048