DEVELOPMENT AND CHARACTERIZATION OF LIGHT WEIGHT LAMINATED COMPOSITE UNDER IMPACT LOADING

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ABSTRACT

Today, armor protection is one of the most important elements of survivability. So developing materials which can withstand all futuristic threats, including those from terrorism has therefore become very critical. Polymer matrix composites (PMCs) are attractive materials in this regard because they are lighter, stronger, and stiffer than unreinforced polymers. Along with PMCs, steel and aluminum alloys are also used in light weight armor materials against projectile impact. The laminated composite materials in which different layers of different materials are bonded together are becoming a key material for future lightweight military, marine, and aerospace hardware as they incorporate high hardness and sufficiently high toughness simultaneously. In this study a layered composite panel of steel and aluminum layers has been bonded with graphene reinforced polyurethane.

Four types of laminated panels were fabricated with steel facing plate followed by a combination of various aluminum alloy layers. The average weight of a 7-layer laminated composite was 7 lb/ft^2 and that of 9-layer laminated composites was 10 lb/ft^2. Different tests, such as tensile test, lap shear strength test, and three-point bend test, have been conducted on the fabricated panels to determine their mechanical properties. The composite laminates' bending stiffness was modeled using ABAQUS finite element software and validated by experiments. The effect of a ballistic impact with armor piercing ammunition was also conducted to qualitatively measure their relative resistance to failure under ballistic loading.