# Application of a Styrene-Butadiene Copolymer Membrane to Di-Commissioned Level A5 Aramid Fibers to Evaluate the Distribution of Impact Force and Their Resistance to Projectiles

Rosado, Lyeme (School: Dr. Pedro Albizu Campus)

A projectile-resistant material is one that can decrease the velocity of a projectile by distributing its impact force. Aramid fibers are woven with long-chain synthetic polyamide composite material, which allow the distribution of the energy of impact of a projectile. In this comparative study, styrene-butadiene copolymer membranes were applied to di-commissioned A5 aramid ballistic vests. Physical studies proved that the styrene-butadiene copolymer membrane showed resistance to impacts and a breaking stress from 3447.38 to 20,684.27 kilopascals. Ballistic tests were performed by a licensed shooter to evaluate how the union of both materials distributes the energy of impact of a 9mm projectile. The ballistic impacts were quantitatively compared in a di-commissioned A5 panel without alterations and a panel prepared with an interlayer of A5 aramid fibers and copolymer membranes. The variable of study was analyzed according to the penetrated layers observed in the interleaved panels and in the panels of level A5 aramid fibers. The greater resulting dimension of a projectile and, the greater extension of penetration in a ballistic panel, the lower the distribution of impact force and resistance to a 9mm projectile. The sample data supported the claim that when applying a styrene-butadiene copolymer membrane to the aramid fibers of an A5 fabric, the distribution of impact force and resistance to a 9mm projectile was less than in those fibers without application of the styrene-butadiene copolymer membrane. These results extend the knowledge of ballistic technology and establish new rules regarding physical applications.

**Awards Won:**