

Multilayer composites with self-healing materials: aerospace applications.

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Abstract

The work is focused on the study of the self-healing properties of the ionomeric polymer EMAA (polyethylene co-acrylic acid), known by the trade name of Surllyn, supplied by the firm DuPont (TM). The self-healing properties of the ionomer depend on different factors, such as projectile diameter versus sample thickness, initial speed of the bullet, angle of inclination of impact relative to the specimen surface and temperature. The self-healing properties of this polymer were triggered by ballistic impact tests carried out at the Transport Safety Laboratory (LaST) at the Politecnico di Milano, by means of a high pressure cannon gun. The tests consisted of impacts at low speed around 200 m/s. The purpose of the work was to fix the specimen and bullet geometrical properties and investigate how the self-healing properties could change with the bullet impact angle and speed. The coupling of the ionomer with materials with higher strength, such as kevlar and carbon fiber composites, that could be used in both aeronautical and space fields, was investigated, with surprising and promising results.

Keywords: self-healing, ballistic impacts, oblique impact, multilayer composites