PHYSICAL MODEL OF CERAMIC-HIGH ENTROPY ALLOYS-BASED LAYERED STRUCTURES FOR BALLISTIC PROTECTION

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Abstract*: Layered structures, including ceramics, Dyneema plates and high entropy alloys plates, are considered to improve the collective ballistic protection against bullets, projectiles and kinetic fragments. In this paper, design and numerical simulation methodology of the ballistic impact processes between bullet-type penetrators and layered structures based on ceramics, Dyneema and high entropy alloys were established.*

Keywords*: high entropy alloys, ceramics, collective protection.*

Layered structures, including ceramics, Dyneema plates and high entropy alloy plates, are considered to improve the collective ballistic protection against bullets, projectiles and kinetic fragments. The choice of the materials, their layer order and their thickness is determined versus state-of-the-art configurations and materials and, more, the protection level desired.

Numerical simulation is an alternative instrument of scientific investigation, being a reliable substitute for expensive or dangerous experiments. Numerical approach is often more useful than experimental traditional methods, conducting to complete information that cannot be otherwise observed, measured or emphasized.

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The objective of the present paperwork was the design and numerical simulation methodology achievement of the ballistic impact processes between bullet-type penetrators and layered structures based on ceramics, Dyneema and high entropy alloys. The validation of the models and simulation methodology were performed using the results from real shooting sessions.

Figure 1 illustrates a layered package made of ceramic and high entropy alloys plates, bonded using an epoxy-based resin. The cross-impact is with an armour piercing incendiary tracer 7.62 mm cal..

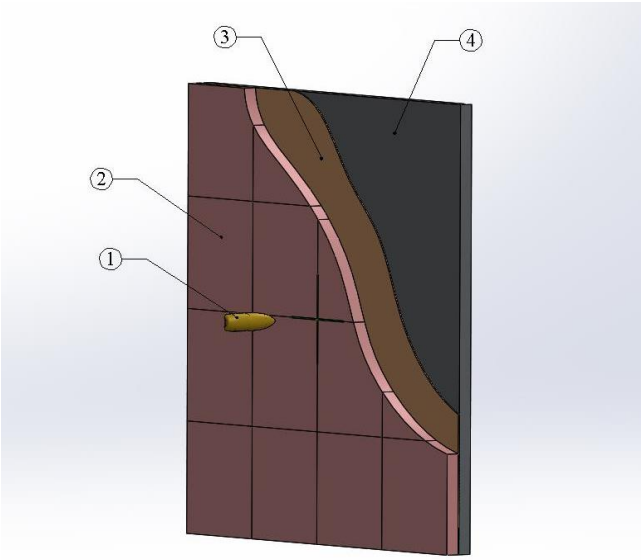

Figure 1. *Physical model of the layered structure made of ceramic plates (2), adhesive (3) and high entropy alloy plate (4) at the impact with an armour piercing incendiary tracer 7.62 mm cal. (1)*

Due to the fact that the study addressed combinations of ceramic, Dyneema and high entropy alloys plates resistant to dynamic stress, the applications for the support of simulation methodology are performed on packages made from two types of materials (ceramics and high entropy alloys), disposed with the ceramic-face towards impact. The dimensions of the designed layered structures are in complete agreement with the experimental model (200 x 200 mm).

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