# Numerical modelling and experimental observation of ballistic penetration process in two-phase metal/ceramic composites

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Ceramic two-phases composites are used in such industries as the armaments industry, aviation, automotive, nuclear power, and space exploration. In several areas, they stand as the source of technological progress. The material is often subjected to extreme loads, such as variable dynamic loads and high temperatures.

The paper presents experimental investigations of ballistic impact on ceramic /metal composites. The internal structure of the novel material consists of ceramic foam made of SiC and filled with Al alloy. The experiment was performed using the ballistic stand and spherical impactor of diameter 5 mm and mass 0.5 g. The impactor hit the sample of diameter 30 mm and thickness 4 mm with a velocity of 600 m/s. Fig. 1 presents crater after impact and defragmented sample.

*Fig. 1: Ballistic impact fragmentation of interpenetrating metal/ceramic composite*

The numerical analysis of the fragmentation process was performed using the finite element method. The internal structure of the composite was assessed using micro-CT selecting both phases, i.e., ceramic foam and AL alloy. The phases are joined by a continuous very small thickness interface. The numerical calculations allow for the description of the whole degradation process of the analysed interpenetrating composite up to the final failure by fragmentation and confirm the novel applicability of the material as a protective layer against the high-velocity impact.

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*References*

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