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## Study of the applicability of porous pressings of aluminum and aluminum alloys as energy-absorbing elements

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This work reports the results of experimental studies on the applicability of porous pressings of aluminum alloys to passive safety systems.

The porous pressings were made from aluminum and aluminum alloy powders with a particle size up to 200  $\mu\text{m}$  using a hydraulic press. The porosity was varied by varying the pressure in the press hydrosystem and the pressing force. The specimens were not sintered, and no plasticizer was added. To determine which specimen characteristic, the mass or the porosity, is more important, specimens of the same mass (0.01 kg) were used [the deviation did not exceed (2.7 – 2.8) %].

To determine the impact absorption ability of the porous pressings of aluminum and aluminum alloy powders, a vertical impact testing machine was used. The ram mass was 22.5 kg (weight 220 N), the fall speed was 5 m/s, and the fall energy was 300 J.

The impact absorption ability of the porous pressings was determined by comparing the accelerations and rebound height of the ram in the presence of a porous pressing with their calculated free-fall values.

The experiments showed that the use of specimens of maximum porosity decreases the impact energy by the value of the plastic work of deformation and the fracture energy.

A comparison of the performance of different specimens showed that the energy absorption ability increases with porosity.

As demonstrated by the experiments, porous pressings of aluminum and aluminum alloys can be used as energy-absorbing elements of passive safety systems for commercial and armored combat vehicles, and the impact absorption ability of porous fillers, in particular porous pressings of aluminum and aluminum alloys, can be determined using vertical impact testing machines. Using porous pressings of aluminum and aluminum alloys as an energy-absorbing material decreases the impact acceleration by a factor of 30 to 85 at an impact speed up to 5 m/s. The ability of a pressing to reduce the impact acceleration depends on its dimensions and porosity to a greater extent than on its mass. The greatest decrease in impact acceleration is provided by porous pressings of maximum porosity, in which the impact energy is converted to the plastic work of deformation and the fracture energy.

**Keywords:** porous pressings of aluminum alloys, impact energy, impact strength, energy-absorbing elements, vertical impact testing machines.

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Received on October 28, 2020,  
in final form on November 26, 2020