Modeling of Random Porosity Foam Microstructures in Aspect of Security and Safety Applications

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One of the possible options as a material for protective layers are aluminium foams which become also very popular due to energy absorbing properties. Such characteristics have been appreciated by the automotive industry in the aspect of crash and impact phenomenon. Energy absorption capacity of foams under blast load was analytically confirmed based on a rigid-perfectly plastic-locking foam model. In this paper the development process of a real foam microstructure based on finite element model with random porosity and numerical analyses during compression tests are presented. The real foam sample model is compared to an idealistic microstructure geometry sample carried out based on Kelvin tetrakaidecahedrons which have the same shape, size and analysis boundary conditions as the real foam one. This kind of modeling is the representation of the hierarchical (fractal) approach describing a porous medium. The model was developed for the comparison of such idealistic, easy to create geometry with the realistic one. In the final part of these investigations the comparison process between numerical and experimental test was performed and presented. Achieved results confirmed the good comparison between both tests.