# Modeling of Work of Filling Granular Filter with Active Cooling

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**Abstract:** The solid propellant gas generators having high gas capacity are widely used for fast pressurization of elastic shells of saving devices of different applications. A typical example of such devices are safety system of automobile (airbags). After collision of an automobile with an obstacle the combustion products of gas generator fill the shell during 60 - 100 milliseconds. However the temperature of combustion products even of "low-temperature" fuel compositions of gas generators appears not below 1500and to reduce of its it is necessary to apply a various types of porous and filling granular filters.

There are passive and active granular filters. The passive filter can cool of combustion products as a result of absorption of heat only. The active cooling is evaporation of the granule material and in this case takes a place more intensive cooling of combustion products in the filter. The numerical modeling of cooling process of high-temperature combustion products at their movement in bulk of granular filter of active cooling is investigated. As the material of granules was used the carbonate of magnesium. At its heating takes a place process of gasification and formation of a porous slag shell which sublimates at higher temperature.

The physical model of such spherical granule can be presented as the central part consisting of the carbonate magnesium surrounded with the porous slag spherical shell through which gaseous products of gasification of the central part are filtered. The problem of distribution of heat in each granule is Stefan problem when at the given temperature on the surface of sphere there is the front of gasification moving inside of the bulk of material. It is assumed that combustion products are the perfect gas moving in the filter.

The upwind difference scheme of the second order of the accuracy with TVD properties was applied to calculation of the movement of gas. The results of calculations at various values of key parameters of the active and passive filters allow to draw a conclusion about enough high efficiency of active cooling filters.

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