To the question of thermal inhibition of laminar flame

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The presented paper is dedicated to the important problem for modern fire-fighting modeling of the inhibition of laminar flame by the particles of inorganic salts. The main goal of the work involved the clearing of the fact: may the effect of flame cooling (thermal inhibition) by mentioned particles contribute significantly in the total process of flame propagation suppression.

The inhibition of the combustion of simplest hydrocarbon - methane by the particles of sodium chloride of various size (their diameters comprised 5 μm, 10 μm, 20 μm, 50 μm and 75 μm) was selected as the model process. The total heat released in the unit of volume of reaction zone (I_+) and the total heat transferred to the solid particles from this volume unit (I_-) were calculated theoretically by means of Simpson approximation method. On this basis the ratio $\alpha = I_- / I_+$ was taken as the quantitative measure of the efficiency of cooling action af solid particles. The values of α coefficient were estimated for the solid particles of various diameter. The results obtained show that numerical values of α are not small. For example, for the particles of 10 μm diameter $\alpha =$ 0.37 . This fact means that the sufficiently large part of heat energy, released in combustion zone, is transferred to the solid particles and isn't consumed for the laminar flame further propagation hindering the combustion process.

In conclusion, we can say the following: in the process of fire extinguishing by the powders, prepared on the basis of inorganic salts, the termal effects may play a significant role. Besides the chemical (homogeneous and heterogeneous) inhibition this circumstance must be taken into account in the course of the study of total complex process of the suppression of combustion reaction.