

## Percolation Phenomena in Heterogeneous Combustion of Condensed Mixtures

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### ABSTRACT

In the present paper, along with the review of principle works on percolation combustion, the original results of analytical and numerical investigation on combustion in disordered solid heterogeneous mixtures near the combustion limits are presented. The consideration is based on the two-dimensional cellular model, where each cell contains either combustible particle (fuel) or inert one (in a random way). We show that propagation of combustion in the vicinity of combustion limits proceeds over a percolation cluster formed by overlapping regions of mutual ignition of fuel particles. Within the framework of proposed approach, the direct contact of fuel particles is not a necessary condition for combustion propagation over the sample. We predict that the critical heat loss level in heterogeneous systems undergoes a jump change when the fuel concentration goes through the percolation threshold corresponding to direct contact of neighboring fuel particles. We also show that the structure of the percolation combustion cluster, as well as the value of the combustion limit, could be determined in terms of the problem of percolation on overlapping spheres.