

Localization of Pyrolysis and Burning of Ground Forest Fires

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Abstract : This paper presents the results of experiments carried out at a specialized test site for establishing macroscopic patterns of heat and mass transfer processes at localizing model combustion sources of ground forest fires with the use of barrier lines in the form of a wetted lay of material in front of the zone of flame burning and thermal decomposition. The experiments were performed using needles, leaves, twigs, and mixtures thereof. The dimensions of the model combustion source and the ranges of heat release correspond well to the real conditions of ground forest fires. The main attention is paid to the complex analysis of the effect of dispersion of water aerosol (concentration and size of droplets) used to form the barrier line. It is shown that effective conditions for localization and subsequent suppression of flame combustion and thermal decomposition of forest fuel can be achieved by creating a group of barrier lines with different wetting width and depth of the material. Relative indicators of the effectiveness of one and combined barrier lines were established, taking into account all the main characteristics of the processes of suppressing burning and thermal decomposition of forest combustible materials. We performed the prediction of the necessary and sufficient parameters of barrier lines (water volume, width, and depth of the wetted lay of the material, specific irrigation density) for combustion sources with different dimensions, corresponding to the real fire extinguishing practice.

Keywords : forest fire, barrier water lines, pyrolysis front, flame front

Conference Title : ICAST 2019 : International Conference on Aerosol Science and Technology

Conference Location : Prague, Czechia

Conference Dates : September 05-06, 2019