11.11 EVALUATION OF GASEOUS EMISSION CHARACTERISTICS DURING FOREST FUEL COMBUSTION IN MASS LOSS CALORIMETER COUPLED WITH FTIR APPARATUS

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Background and Aims: The influence of forest fires on the global composition of the atmosphere is well known, and especially its influence is much more pronounced at the beginning of the 21st century, with increasingly frequent occurrences of large-scale fires. In most cases, its dramatic impact on air quality is expressed in forest fires that last for tens of days. Due to the increased frequency, there is a need to monitor the parameters that contribute to ambient air pollution, which means improving the quantification of fire emissions. Emission gases from forest fires consist of a large number of gases, aerosols, and particle matter. The most common are carbon dioxide (CO_2) and carbon monoxide (CO), methane (CH_4), and other volatile organic carbon compounds (VOCs) (Solene Turquety, 2013). This paper investigates the chemical composition of smoke, during the combustion of terminal branches of *Pinus sylvestris*. The paper includes the research of the chemical structure of combustion products in laboratory conditions.

Methods: Controlled combustion of *Pinus sylvestris* was performed in laboratory conditions using a mass loss calorimeter, whose environment was further adapted to sample emission concentrations. Samples were exposed to heat flux of 50 kW/m^2. Sampling was performed with a gas analyzer Gasmet DX4000, which works on the principle of FTIR technology. The gas analyzer has a library of 16 different compounds. In addition to emission concentrations, flammability parameters were also measured and analyzed.

Key results: Results show the presence of H_2O, CO_2, CO, NO, NH_3, CH_4, and C_2H_4 concentrations. Compounds with concentrations below 10 ppm were not taken into further analysis. Measured concentrations were compared with heat release rate (HRR), mass loss rate (MLR), to find the dynamics of generating the emissions concentrations.

Conclusions: During the tests, H_2O, CO_2 were released during the flaming and smoldering stage. Increase concentrations of CO, NO, NH_3, CH_4, and C_2H_4 concentrations were observed during the flaming stage. Dynamic combustion and gaseous emissions primarily depended on the chemical composition, physical structure, and moisture content of samples.

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