

Study of early stage of soot formation in a flat laminar ethylene/air flame by mass spectroscopic method

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Soot particles, when released into the atmosphere, have a negative impact on the Earth's climate and human health. The formation and growth of soot particles are complex phenomena that include many physical and chemical processes. The early stages of soot formation are of the greatest interest: the formation of a first aromatic ring, the growth of polyaromatic hydrocarbons, and the transition from gas-phase components to the condensed phase. To study these processes in detail, the experimental measurements in standard McKenna burner by a quadrupole mass spectrometer have been developed. A sampling system was designed, by which the components of the flame, entering the sampler, are diluted in an overwhelming amount of nitrogen and stop chemical interactions. The intensities of the mass peaks of the flame components at different heights above the burner in the range from 0 to 300 a.m.u. were determined. Additionally, the results of kinetic modeling using the CRECK mechanism in the Cantera program are presented. This study was funded by the Russian Science Foundation, project № 23-19-00407.