The LIF diagnostics of PAH and NOC during hydrocarbons pyrolysis behind shock wave

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The soot is an undesired product of incomplete combustion and pyrolysis of hydrocarbons. The main precursors of soot are considered to be polycyclic aromatic hydrocarbons (PAH). Both the soot and its precursors have negative effects on human health and environment. Further investigations of the chemical processes involved in soot formation are needed to reduce soot emission. Laser-induced fluorescence (LIF) method is one of the promising tools for studying complex chemistry of soot formation. Temporal LIF signals can give the information on the mixture composition, with LIF it is possible to detect nano-organic carbon (ultra-fine particles up to 5 nm in size). Spectral LIF give the information on growth of the soot precursors. This work was focused on obtaining temporal and spectral LIF signals from acetylene mixture pyrolysis. Emission of the mixture was induced by 75 ps laser pulse on the wavelength of 266 nm. Then emission of the mixture was focused on the PMT and on the slit of the spectrometer simultaneously. With PMT temporal signals were obtained. The spectral composition of the mixture's radiation was recorded by a spectrometer combined with an ICCD camera. In present study time-resolved LIF signals as well as spectra records were obtained from reacting mixture of pyrolyzed acetylene. The temporal signals showed the presence of nano-organic carbon (NOC) in mixture. Spectral signals were composed of thermal emission from particles and fluorescence of PAHs and NOC. Influence of the temperature and pressure on recorded spectra are discussed. This study was funded by Russian Science Foundation, project 23-19-00407.