

INVESTIGATION OF PREMIXED LAMINAR SOOTING FLAME BY INFRARED PYROMETRY

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Abstract

The comprehension of soot formation in combustion processes relies on crucial parameters such as soot temperature, emissivity, and concentration. Moreover, the evolution of carbonaceous nanoparticles within the flame environment, undergoing a transformation from nascent to mature soot through coagulation and coalescence processes, alters their physical and chemical properties as their residence time increases.[1]

In this work, two-color – or ratio – pyrometry performed with a science-grade infrared camera, after a preliminary calibration of the spectral response of the camera in the measuring setup, allows to reconstruct the two-dimensional temperature field of a premixed laminar sooting flame.[2] The use of infrared narrow bandpass filters in the wavelength regions where the emission of the combustion gases is minimal guarantees that the measured radiance predominantly originates from the soot particles. Finally, a two-dimensional mapping of the soot emissivity is obtained, providing insight about the particles evolution within the flame.

References

- [1] G. De Falco et al. / Proceedings of the Combustion Institute 36 (2017) 763–770
- [2] Y. A. Lavendis et al. / Rev. Sci. Instrum. 63 (1992) 3608–3622