



MEASUREMENTS OF DISPERSION CHARACTERISTIC OF REFRACTIVE INDEX IN AN AXISYMMETRIC METHANE JET FLAME USING THE METHOD OF THE AVERAGED TALBOT-IMAGES

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Other keywords: concentration of species in methane flame, temperature

ABSTRACT: In the recent years, the possibilities of the numerical modeling in the field of the turbulent combustion have increased significantly. However, there are a lot of processes which have a direct relation to practical systems, and are required to further verification of simulation models. Today the main working tools for experimental studies of combustion processes are optical diagnostic methods. The major comparison of modeling and experiments are based on the time-averaged statistics of velocity, temperature and concentration of the mixture components.

This work describes an application of the optical method based on the Talbot effect for the diagnostic of turbulent combustion processes with high-frequency fluctuations and small-scale structures. The experimental system employs observed in the laser radiation Talbot effect with digital registration as a time averaged refractive index probe in the reacting flow. The analysis of the laser wave front distortion after passing flame is used to determine time averaged and r.m.s. fluctuations of refractive index. It is demonstrated that measurements of the dispersion characteristic of refractive index at multiple wavelengths can be used to calculate temperature and major species concentrations in the axisymmetric reacting methane-air jet. In this work an estimation of sensitivity for the method of averaged Talbot-images is given.

It is shown that the averaged Talbot-images technique provides measurements with high spatial resolution for entire flow field of axisymmetric reacting jet. Measurement of dispersion characteristic of refractive index at six wavelengths for reacting methane jet issuing into the air are reported. On the basis of the dispersion characteristic, the temperature field and the major species concentration fields are calculated and presented.

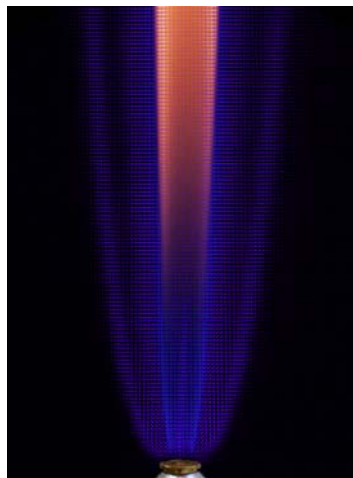


Fig. 1 Flame picture on the background of the averaged Talbot-image for reacting methane jet.