Post-doctoral position at University of Lille (France)

Optimization of multi-line laser induced fluorescence (LIF) thermometry technique for application in different flames

Context

Laser induced fluorescence (LIF) is a laser diagnostic allowing in situ measurements of flame temperature. The technique relies on the excitation of several rovibronic transitions of a fluorescent molecule using a tunable laser source and to the subsequent collection of the fluorescence signal. Among the species used for thermometry, NO is a good candidate because this molecule can be seeded as a tracer in the reactive mixture, allowing the measurement of the complete temperature profile from the burner surface to the burnt gases. NO LIF thermometry was shown to be well suited for stationary flames from low pressure to high pressure and from non sooting to sooting flames.

Several procedures were proposed in the literature aiming to improve the accuracy of multi-line LIF thermometry while reducing the duration of the spectral scan. However we observed* in different investigations that we performed at PC2A** that this accuracy is very dependent on the selected spectral range and that this spectral range needs to be adjusted according to the kind of flames.

** Lamoureux et al. Combust. Flame 157(2010)1929 ; Bejaoui et al. Appl. Phys. B118 (2015)449; El Bakali et al. Fuel 211 (2018)548*

Objectives

The objective of the postdoctoral position is to perform a thorough investigation of the performances of the NO LIF thermometry in order to tend towards a universal procedure that could be applied in a large range of combustion conditions. The postdoctoral researcher will have an already complete operating LIF thermometry set-up composed by a frequency-doubled Nd:YAG-seeded laser pumping a dye laser, an imaging spectrometer, a camera ICCD, a fast oscilloscope and a PMT. The experiment and data acquisition is driven through Labview program. Several burners and flame conditions will be available. Signal post-treatment and spectral simulation tools will be applied. The optimization of the experimental procedure will rely partly on the achievement of the best fit between the experimental excitation LIF spectrum and a library of simulated spectra calculated on a large range of temperatures.

The postdoctoral researcher will be supported by the laser diagnostics team. However he/she will take part in the combustion team, involved in various chemical flame structure studies. The temperature profiles being crucial data for flame modelling, the postdoctoral researcher will be associated in several projects in parallel.

Essential Education and Research Skills

Following is a list of skills being desired.

- Ph.D. degree in Chemical or Mechanical Engineering.
- Experience in tunable laser metrology is required
- Basic knowledge of LIF, laser absorption, spectral simulation
- Working experience with photomultiplier tube, image intensifier ICCD camera, spectrometers
- Data post processing techniques will be considered an asset.
- Fluent english is required

Position details: This work is supported by CPER CLIMIBIO (http://climibio.univ-lille.fr/). Month salary depends on candidate experience. Duration: 12 months. Possibility of extension. Starting from March 2019.

Contact Person

Please send your application to Pascale Desgroux (pascale.desgroux@univ-lille.fr) and Nathalie Lamoureux (nathalie.lamoureux@univ-lille.fr) including a cover letter, CV, two references and publication list.

**Laboratory “Physicochimie des Processus de Combustion et de l’Atmosphère” (PC2A) http://pc2a.univ-lille.fr/fr is a joint laboratory between Lille University and CNRS.