Postdoctoral position in:

Development of two-line atomic fluorescence for gas-phase temperature measurements in combustion

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The design of future ultra-compact gas turbines requires to address near-wall energy processes. Among others, heat losses are critical as burnt gases temperature is much higher than melting points of common metal alloys [1]. A premature aging of materials can reduce the overall system lifetime so that the main purpose of combustor designers is to reduce heat transfer to the wall. Detailed experimental data of wall temperature and heat fluxes are therefore required to improve design of future combustion technologies and fidelity provided by coupled multi-physical numerical simulations.

CNRS-CORIA activities are centered on research fields related to energy and propulsion systems. The reactive flows department is primarily devoted to develop and implement advanced laser-based diagnostics to a large variety of industrial applications (e.g. aerospace or fire and safety science). In order to acquire an expertise in near-wall combustion, a postdoctoral position is currently open.

This research aims to develop 2D gas-phase thermometry by two-line atomic fluorescence on Indium atoms (TLAF-In), and to implement this technique for near-wall flow temperature in combustion environments. TLAF-In has proved to be a highly-sensitive and efficient method to probe temperature in harsh environments [2, 3]: temperature is retrieved by probing two electronic states of Indium atoms and by measuring the respective fluorescence signals emanating from the same excited upper electronic state.

The research responsibilities entail mainly:

- Implementation of a fundamental optical setup (i.e. test cell), with a particular care to the atomic seeding system.
- Feasibility, proof-of-concept on a laminar burner and systematic study to study effect of the atomic concentration, issues related to laser absorption, laser fluence linearity, measurement accuracy and spatial resolution.
- Implementation on a case of flame/wall interaction.

Candidates should have a PhD in mechanical engineering or optics. Knowledge in fluid mechanics and optical diagnostics for reactive flows is required. Experience and conducting experiments in combustion is appreciated.

The funding is secured for one year, with possibility to renew (subject to additional funding and satisfactory performances). Interested candidates should send a detailed academic CV (including list of publications) and contact details of two/three references.

[1] Poinsot, P. & Veynante, D., Theoretical and Numerical Combustion, 3rd edition, 2011.
[2] Haraguchi, H., Smith, B., Weeks, S., Johnson, D. J. & Winefordner, J. D., Appl. Spectrosc. 31(2), 156-163, 1977.
[3] Kaminski, C. F., Engstrom, J. & Alden, M., In Symp. (Int.) on Combustion 27(1), 85-93, Elsevier, 1998.