European Research Council

PostDoc (M/F): Laser diagnostics in hydrogen high pressure turbulent flames

Context: This postdoctoral fellowship is part of the ERC SELECT-H project (European Research Council, Grant Agreement No. 101097984), described at https://cerfacs.fr/select-h/. The global shift from hydrocarbon-based fuels to hydrogen presents numerous challenges for combustion systems. At IMFT (Institut de Mécanique des Fluides de Toulouse), in collaboration with project partners, we are investigating hydrogen flames in a variety of canonical burner configurations. The goal is to better understand the fundamental physics driving the observed phenomena and to generate high-quality experimental data for the validation of high-fidelity reactive flow simulation codes.

Objectives: The successful candidate will play a key role in supervising PhD students working on IMFT test facilities and will collaborate closely with teams responsible for numerical simulations of hydrogen combustion. She/He is expected to take an active and creative role in shaping the research direction, contributing original ideas and developing his own research line. Specifically, the candidate will focus on advancing optical and laser diagnostics for the detailed analysis of hydrogen flames under both laminar and turbulent conditions, at atmospheric and elevated pressures. The overarching goal is to enhance IMFT's diagnostic capabilities over the next two years, with a focus on measuring temperature, major chemical species, intermediate radicals and pollutant emissions.

Work Program: Hydrogen flames will be studied using fully instrumented and optically accessible test benches at IMFT. These include laminar premixed flames, turbulent swirled flame configurations with separate air and hydrogen injection, jet flames, and wall-impinging flames fueled from high-pressure reservoirs. The candidate will develop and implement diagnostic techniques to measure the temperature fields, species (including main and radicals), and pollutants. She/He will actively participate in experimental campaigns, propose new experimental configurations, and contribute to the development of new techniques, which are not mastered yet at IMFT. The work will involve drawing connections to theory, provide high quality data for validation of numerical flow simulations and develop physics-based models. The results are expected to be disseminated through high-impact peer-reviewed journal publications and presentations at leading national and international conferences.

Management: The candidate will be supervised by Thierry Schuller (PI ERC SELEC-H, Professor Université Toulouse & Insitut Universitaire de France).

Location: The Institute of Fluid Mechanics of Toulouse (IMFT) is a mixed research unit bringing together the CNRS, the INP of Toulouse and the University of Toulouse 3. With around 200 people (65 researchers and teacher-researchers, 35 staff of research support, 80 doctoral students and 20 post-doctoral students), it represents one of the strongest potentials for French or even European research and advanced training in the field of fluid mechanics, both in terms of its size and its spectrum of the research themes addressed there and the fields of application they cover. Located in Toulouse on an island in the Garonne, the laboratory develops a wide range of research which covers both the fundamental aspects associated with the physical phenomena involved in flows and their mathematical description, as well as a vast field of applications.

Reqirements: The candidate needs to hold a PhD in Applied Physics, Mechanical Engineering, Energetics or Aerospace Engineering with a focus on laser diagnostics in reactive flows. Proficiency in laser diagnostics and combustion is essential. Experience with high-pressure systems is highly valued

Application: https://euraxess.ec.europa.eu/jobs/356424