

ERC Advanced Grant CRESUCHIRP – PhD Position 1

Title of Thesis: CRESUCHIRP - Ultrasensitive Chirped-Pulse Fourier Transform mm-Wave Detection of Transient Species in Uniform Supersonic Flows

Thesis subject: The CRESU (Reaction Kinetics in Uniform Supersonic Flow) technique, combined with laser photochemical methods, has been applied with great success to perform research in gas-phase chemical kinetics at low temperatures, of particular interest for astrochemistry and cold planetary atmospheres, as well as for combustion and atmospheric chemistry.¹⁻⁶ Recently, we have been involved in a collaboration with Arthur Suits (U. Missouri) and Bob Field (MIT) to develop a new combination of the revolutionary chirped pulse broadband rotational spectroscopy technique invented by Brooks Pate and co-workers⁷ with a novel pulsed CRESU, which we have called Chirped Pulse in Uniform Flow (CPUF).⁸⁻¹⁰

Recently, the European Research Council (ERC) has awarded an Advanced Grant to Ian Sims along with his senior collaborators and a team of external experts (project CRESUCHIRP¹¹). In this project we aim to exploit the exceptional quality of the Rennes CRESU flows to build an improved CPUF instrument, and use it for the quantitative determination of product branching ratios in elementary chemical reactions over a wide temperature range (data which are sorely lacking as input to models of gas-phase chemical environments), as well as the detection of reactive intermediates and the testing of modern reaction kinetics theory. Applications to the areas of combustion and atmospheric chemistry are also envisaged.

The successful candidate will work closely with Ian Sims and the CRESUCHIRP team at the IPR as well as with a number of internationally renowned external experts. The project is fully funded by the ERC as well as the Brittany Region and Rennes Metropole, and new, dedicated laboratory and office space has been created. The Rennes Laboratory Astrophysics group¹² is internationally known for its experimental studies of elementary processes of interest for astrophysics, atmospheric science and combustion,¹⁻⁶ and provides an excellent environment for PhD training.

The position is available starting in September or October 2017 for a period of three years. A very competitive salary will be proposed (approx. 1650 € net / month). Candidates should possess a Masters degree (M2) in physics or (physical) chemistry. Experience in experimental research and especially the use of lasers, spectroscopy, vacuum techniques and high speed electronics would be advantageous. Inquires and applications, including a detailed CV citing grades, an accompanying letter, and the names and contact details of three potential referees, should be addressed to Prof. Ian Sims (ian.sims@univ-rennes1.fr).

Keywords: Chirped Pulse Fourier Transform Microwave Spectroscopy (CPFTMW), CRESU, Low Temperature Reaction Kinetics, Product Branching Ratios, Elementary Reactions, Molecular Astrophysics, Experimental Astrochemistry, Chemical Physics, Gas-Phase Physical Chemistry

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