PhD position in Laboratory Astrophysics – Institute of Physics of Rennes

Reactive collisions with ions at low-temperature: new routes to complex organic molecules in astrophysical environments

One of the major questions in astrochemistry is to understand how the cycle of matter between the different phases leads to an increase in molecular complexity.

The Department of Molecular Physics plays a leading role at the international level in laboratory astrophysics and in the field of gas-phase physical chemistry in extreme environments.

The objective of the thesis is to identify the key ionic processes leading to the formation of complex organic molecules in astrophysical environments. Only a fraction of the studied ion-molecule reactions generates heavy species, most leading to products of similar size to the reactants. In practice, we will explore the kinetics and the temperature dependence of each of the exit pathways of a selection of reactive collisions. The data obtained on the identification of products and their branching ratios will be directly usable in photochemical models of astrophysical environments.

The selected approach is based on the combination of uniform supersonic flows generated with the CRESU method and mass spectrometry for product detection.

Initially, we propose to focus our work on the study of a selection of reactions involving carbonaceous ions such as CH_3^+, $C_2H_5^+$, identified as major players in the chemistry of Titan's ionosphere and the interstellar medium.

Candidate profile

We are looking for a good candidate who must have a Master's degree (or equivalent diploma) in physics, physical-chemistry or astrophysics. She/he must have strong aptitudes for experimental work and an inclination for teamwork. Experience in the field of experimental molecular physics or mass spectrometry would be an advantage. Data analysis skills would also be appreciated.

Deadlines and procedure

The position will start on October 1, 2022 for a period of 3 years. The deadline for applications is 08 Jul 2022 but applications will be reviewed as they are received and the position will likely be filled before this date.

Inquiries and applications, including a detailed CV, a cover letter and the names and contact details of two (or three if possible) contacts, should be addressed to Ludovic Biennier (ludovic.biennier@univ-rennes1.fr).

Keywords

Reactive collisions, astrochemistry, laboratory astrophysics, low temperature ionic processes, elementary reactions, supersonic flows.