2-year postdoc (CNRS/IN2P3) on the DIAM-Origin project at IP2I - Lyon, France

Expected date of employment: 1 September 2021.

Key prebiotic steps for origin of life can occur under a variety of conditions involving various time and space scales: the formation of atomic nuclei, inorganic molecules, organic precursor molecules, the formation of the basic building blocks of life, and the formation in abiotic conditions of the functional polymers necessary for the appearance of the primitive life. The recent development of astrophysical instrumentation opened new windows on the Universe and many complex molecules were observed in space in various contexts.

DIAM-Origin is an experimental project combined with theoretical developments (F. Calvo, Laboratoire interdiciplinaire de physique, LIphy, Grenoble) on the thermalization of size- and velocity-controlled protonated molecular clusters in rare-gas nanodroplets. New processes in the thermalization of size- and velocity-controlled molecular clusters were highlighted thanks to DIAM (Dispositif d'irradiation d'agrégats moléculaires), an innovative device built at IP2I [1-4]. Studies on molecule evaporation from pure and doped water nanodroplets based on correlated neutral and ion time-of-flight technique [5-7] and supported by statistical molecular dynamics simulation give new insights in the early steps of aerosol formation in the Earth atmosphere [4].

The DIAM-Origine project is devoted to provide useful insights into fundamental aspects on interaction between molecules in extraterrestrial environments where low density, irradiation, and low temperature are involved. Within this framework, the objective of the project is to focus on model situations where coupling experimental measurements (IP2I/DIAM-IN2P3) and theoretical developments (LIphy-INP) is challenging. Helium nanodroplets offer the opportunity to embed atoms, molecules or clusters in a cold quantum environment in order to study model systems for better understanding the processes involved under such extreme conditions. Soft landing and submersion of mass-selected ions onto helium nanodroplets will be developed combining molecular cluster manipulation, time-of-flight mass spectrometer, and correlated detection techniques. In a further step, the doped droplet will be irradiated by proton impact, aiming to address thermalization versus intra-cluster reactivity in such extreme conditions. The successful applicant will be in charge of experimental work in close collaboration with the scientific and technical staff involved in this project.

Applicants should hold a phD in physics or chemical-physics. The candidates are expected to
- be able to integrate and work in a team, while leading a specific scientific effort and contributing to the general experimental program
- have hands-on experience in experimental physics, preferably in radiation science, experimental astrochemistry, cluster physics, mass spectrometry, and statistical data analysis.

The Candidate should submit a CV, an application letter, 2 letters of recommendation and the names and contact emails of 2 referees to Prof Michel Farizon m.farizon@ip2i.in2p3.fr

[1] H. Abdoul-Carime et al., Angew. Chem. Int. Ed. 54, 14685 (2015)
[2] F. Calvo et al., Eur. Phys. J. D 71, 110 (2017)
[3] F. Berthias et al., Phys. Chem. Chem. Phys. 20, 18066 (2018) ; J. Chem. Phys. 149, 084308 (2018)
[4] L. Feketeová, et al., Proc. Natl. Acad. Sci. (2019) DOI: 10.1073/pnas.1911136116
https://www.cnrs.fr/fr/comment-une-molecule-peut-changer-le-climat
[5] G. Bruny et al., Rev. Sci. Instrum. 83, 013305 (2012)
[6] C. Teyssier et al., Rev. Sci. Instrum. 85, 015118 (2014)
[7] F. Berthias et al., Rev. Sci. Instrum. 88, 08301 (2017) ; Rev. Sci. Instrum. 89, 013107 (2018)