Postdoctoral Associate

Astrochemistry of sulfur: reaction network and spectroscopy.

Research context

Matter in the Universe is capable of forming complex molecules only in regions of space where conditions allow for bond formation. In these bond-forming regions, matter may exist as an extremely diluted gas or be found in denser regions including quiescent interstellar molecular clouds, turbulent star-forming regions, or in circumstellar shells. Many chemical species have already been detected in molecular clouds which consist of gas and tiny dust particles. Physical conditions in these vast galactic spaces, in terms of density, temperature (very low) and radiation fluxes (very high), are much different from those generally found on Earth and, at first glance, would seem a hostile and strange environment in which to observe complex chemistry and formation of possibly fragile bonds. Nevertheless, these conditions allow for the synthesis and existence of certain, mostly unsaturated molecules. Molecules containing sulfur, one of the ten most abundant elements in the Universe, are the focus of this project. Quite a number of sulfur-bearing molecules have already been detected in space, among them carbon sulfide (CS), carbonyl sulfide (OCS), hydrogen sulfide (H$_2$S), and small organic species like thiomethanol (CH$_3$SH). Although several sulfur species have been identified in space, much less is known about how they are produced and then transformed. Here, we wish to elucidate currently unknown interstellar synthetic routes leading to formation of several sulfur-bearing species and to identify the factors contributing to their further transformation or destruction. We also intend to predict the spectroscopic parameters for certain relevant molecules along this path which may be candidates for detection in space.

Description of task

The Postdoctoral Associate is to assume responsibility for experimental studies investigating thermal and photochemical transformations of sulfur species occurring in laboratory analogues of interstellar ices. Solid Ar, CO or H$_2$O samples doped with selected sulfur containing molecules will be the main focus of these studies. These laboratory ice analogues will be formed under
vacuum conditions using closed cycle He cryostats, subjected to a variety of thermal and photochemical processing steps and analysed spectroscopically. Methods for irradiation include the use of an excimer laser, various microwave discharge lamps, UV LEDs, and electrical discharges among others. Fourier transform infrared spectroscopy will be the main analytical method used to observe the transformations induced by this radiation, although additional measurements using Raman scattering, as well as UV-VIS absorption and luminescence, are also available.

**Information about Institute**

The Institute of Physical Chemistry of the Polish Academy of Sciences is one of the leading research organizations in Poland and has received the HR Excellence in Research Award. Research topics currently under investigation span the fields of chemistry, physics, astronomy, and biology.

**Salary and Benefits**

1. a full-time, 3 year contract (supported by an NCN grant);
2. competitive salary for the Warsaw area;

**Requirements**

1. PhD qualified in physics, chemistry, astronomy, or equivalent specialization.
2. PhD title granted in 2009 or after (some exceptions possible, as defined by NCN rules)
3. experience and proven research skills in physico-chemical laboratory work;
4. competence in molecular spectroscopy, chemistry, and physics;
5. experience with cryogenic techniques, high vacuum techniques, photochemistry, or astrochemistry will be an advantage;
6. proficiency in written and spoken English

**References**

At least one letter of reference and the names of two other potential references are required.

**To apply:**

All application materials, preferably in pdf format, should be sent to Dr. Marcin Gronowski (mgronowski@ichf.edu.pl) before 8.02.2016 and should include a cover letter, a CV, a publication
list, one letter of reference, and the names and contact information for two additional references. The letter of reference can be sent directly by the recommending party.

The CV should contain the declaration: “I hereby declare that I give consent for my personal data to be stored and processed by the Institute of Physical Chemistry of the Polish Academy of Sciences, 01-224 Warszawa, Kasprzaka 44/52, the organizer of a competition for a research post, solely for the purposes of that competition (under the Personal Data Protection Act of 29 August 1997, Dz. U. 1997 No. 133, item 883 as amended).”

Selected candidates will be invited for an interview at the Institute or via Skype. The Interviews will be held on 12.02.2016.

The applicants will be informed about results of selection process by 17.02.2016.

For further information on the position please contact:

Dr. Marcin Gronowski,

e-mail: mgronowski@ichf.edu.pl