Surface formation routes of interstellar molecules : a laboratory study

Sergio, I.

Publications

Refereed papers

- *Water formation by surface O_3 hydrogenation*
  Romanzin, C., **Ioppolo, S.**, Cuppen, H. M., van Dishoeck, E. F., Linnartz, H. 2010, submitted to Journal of Chemical Physics (Chapter 6)

- *Competition between CO and O_2-ice hydrogenation channels and surface formation of CO_2 at low temperatures*
  Ioppolo, S., van Boheemen, Y., Cuppen, H. M., van Dishoeck, E. F., Linnartz, H. 2010, submitted to Monthly Notices of the Royal Astronomical Society (Chapter 7)

- *The influence of temperature on the synthesis of molecules on icy grain mantles in dense molecular clouds*
  Garozzo, M., La Rosa, L., Kanuchova, Z., **Ioppolo, S.**, Baratta, G. A., Palumbo, M. E., Strazzulla, G. 2010, accepted for publication in Astronomy & Astrophysics

- *Surface formation of HCOOH at low temperature*
  Ioppolo, S., Cuppen, H. M., van Dishoeck, E. F., Linnartz, H. 2010, accepted for publication in Monthly Notices of the Royal Astronomical Society (Chapter 8)

- *Water formation at low temperatures by surface O_2 hydrogenation II: The reaction network*
  Cuppen, H. M., **Ioppolo, S.**, Romanzin, C., Linnartz, H. 2010, Physical Chemistry Chemical Physics, 12, 12077-12088 (Chapter 5)

- *Water formation at low temperatures by surface O_2 hydrogenation I: Characterization of ice penetration*
  Ioppolo, S., Cuppen, H. M., Romanzin, C., van Dishoeck, E. F., Linnartz, H. 2010, Physical Chemistry Chemical Physics, 12, 12065-12076 (Chapter 4)

- *Hydrogenation reactions in interstellar CO ice analogues. A combined experimental/theoretical approach*
  Fuchs, G. W., Cuppen, H. M., **Ioppolo, S.**, Romanzin, C., Bisschop, S. E., Andersson, S., van Dishoeck, E. F., Linnartz, H. 2009, Astronomy & Astrophysics, 505, 629-639 (Chapter 2)

- *Formation of interstellar solid CO_2 after energetic processing of icy grain mantles*
  Ioppolo, S., Palumbo, M. E., Baratta, G. A., Mennella V. 2009, Astronomy & Astrophysics, 493, 1017-1028 (Chapter 9)

- *Laboratory evidence for efficient water formation in interstellar ices*
  Ioppolo, S., Cuppen, H. M., Romanzin, C., van Dishoeck, E. F., Linnartz, H. 2008, Astrophysical Journal, 686, 1474-1479 (Chapter 3)

Conference Proceedings

- *Formation of alcohols on ice surfaces*
  Cuppen, H. M., Fuchs, G. W., **Ioppolo, S.**, Bisschop, S. E., Öberg, K. I., van Dishoeck, E. F., Linnartz, H. 2008, Organic Matter in Space, International Astronomical Union Symposium, 251, 377-382

- *Laboratory study of CO ice hydrogenation*
  Ioppolo, S., Fuchs, G. W., Bisschop, S. E., van Dishoeck, E. F., Linnartz, H. 2007, Molecules in Space and Laboratory

- *Solid state astrophysics and chemistry: four questions - four answers*
  Linnartz, H., Acharyya, K., Awad, Z., Bisschop, S. E., Bottinelli, S., Bouwman, J., Cuppen, H. M., Fuchs, G. W., **Ioppolo, S.**, Öberg, K. I., van Dishoeck, E. F. 2007, Molecules in Space and Laboratory

- *Ion irradiation of TNO surface analogue ice mixtures: the chemistry*
  Baratta, G. A., Brunetto, R., Caniglia, G., Fulvio, D., **Ioppolo, S.**, Leto, G., Palumbo, M. E., Spinella, F., Strazzulla, G. 2007, Memorie della Società Astronomica Italiana Supplementi, 11, 185-189

Curriculum Vitae

Originally from Italy, I was born on November 17, 1980 in the city of Catania. In 1994 I began my high school education at the Liceo Scientifico Galileo Galilei, a school for science. I graduated in five years with the highest possible grades. During these years I developed passion for physics and mathematics and I decided to continue my education at the University of Catania at the department of Physics; there I began my specialization in Astrophysics. My master thesis constituted of experimental investigations of the formation of interstellar solid CO_2 after energetic processing of icy grain mantles. The research was carried out in the LASp (Laboratory for Experimental Astrophyiscs) in Catania, under the supervision of Dr. Maria Elisabetta Palumbo and Prof. Giovanni Strazzulla and resulted in a publication.

My following doctoral studies began after receiving an invitation from the Raymond and Beverly Sackler Laboratory for Astrophysics in Leiden, the Netherlands. Supervised by Prof. Harold Linnartz, Prof. Ewine van Dishoeck, and Dr. Herma Cuppen (daily supervisor) my PhD project dedicated to the experimental investigation of surface formation routes of interstellar molecules took shape. All experiments were performed using SURFRESIDE which consists of an ultra-high vacuum main chamber and a hydrogen/deuterium atomic line and allows to study H-atom addition reactions in interstellar ice analogs under astronomically relevant conditions. The doctoral research resulted in seven publications using SURFRESIDE, which are presented in this thesis. In addition, the project required the construction and implementation of a second atomic beam line on SURFRESIDE. I have worked together with Dr. Guido Fuchs and Dr. Claire Romanzin in the development of the new system. Along with my research, I also supervised the work of two bachelor students from the Leiden University and one graduate student from the University of Catania, Italy. Furthermore, I had the opportunity to spend one month as a visiting researcher at the Laboratory for Experimental Astrophysics (LASp). During my PhD studies, I took part of several international and national scientific conferences and summer schools in the Netherlands, the UK, France, Germany, and Iceland where I presented my work. I will continue my scientific career in the Sackler Laboratory for Astrophysics as a postdoctoral researcher with the intention to test, prove and tune the newly reconstructed SURFRESIDE setup, and to continue the investigation of more complex surface formation routes of interstellar molecules by using a double atomic beam line.

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Nadine, and Suzanne, I enjoyed the time we spent together in and outside of the Lab. Michele, Emily, and little Francesca, I feel lucky I met such a great family and friends. To the new people in this group, Gleb, Jean-Baptiste, and Steven, I wish all the best. Dominic, Simon, Karoliina, Silvia, Ernst, and Francisco, you are the best office mates. Outside of work, I would like to mention a few friends that stayed by me throughout the years. Rafael, we shared so many great and unforgettable moments, you are a real friend. Kalle, our sailing trip along the West Swedish coast is one of the best adventures of my life. Nicola, you made our weekly climbing sessions a pleasure. Titti and Carina, you made me laugh like never before. Franco, Paola, and Daniele, thank you for making my time abroad less lonely, I consider you to be part of my family.

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