

Colloquium

SFB 956

Conditions and Impact of Star Formation

19.05.2014

Monday 4:00 pm

Physikalische Institute Köln

Lecture Hall III

Zülpicher Straße 77 | 50937 Köln

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Recent Advances in Uniform Supersonic Flows, Gas Phase Reaction Kinetics Applications

Observation of the Interstellar Medium has demonstrated the existence of a large number of molecules surviving in harsh environments penetrated by energetic particles and photons and characterized by their very low temperature (7 – 50 K typically) and ultra-low densities ($1 - 10^5 \text{ cm}^{-3}$ typically). Understanding the fate of these molecules and more precisely identifying the formation and destruction processes affecting their abundance has become a challenge for several decades for astrophysicists. Chemical modeling required developing numerical networks of chemical and physical processes involving thousands of reactions which efficiency had to be known at such unusual temperatures as well as the nature of the products generated by each of these processes. Assistance of laboratory experiments and theoretical calculations has been crucial therefore to constrain and optimize modeling of interstellar objects.

In the last decades, several experimental developments have allowed the scientific community to tackle this difficult task and a significant number of data (although largely insufficient) were delivered and introduced in the interstellar chemical networks. Among these techniques, uniform supersonic flows (the so-called CRESU technique) constituted an important breakthrough in the early eighties when applied to the study of cation-molecule reactions. A second breakthrough occurred in the early nineties when the technique was coupled to lasers for the investigation of neutral-neutral reactions, a large number of which were found to be very efficient at very low temperatures, opposite to the common thoughts at these times.

The talk will focus on recent technical and scientific advances of the CRESU technique which will be presented in detail. Significant results will be shown concerning some neutral-neutral reactions and new challenges will be pointed out.

