

Colloquium

SFB 956

Conditions and Impact of Star Formation

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Monday 3:00 pm

Physikalische Institute Köln

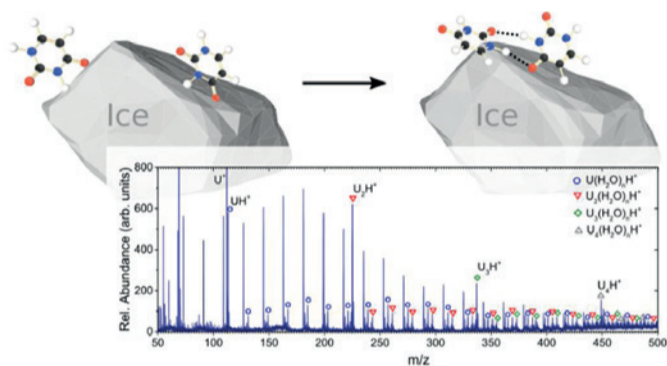
Lecture Hall III

Zülpicher Straße 77 | 50937 Köln

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Reactions of Molecules on Ice Nanoparticles: Synthesis of Complex Molecules from Simple Precursors in the Space



Extremely low densities leading to rare collisions between molecules and low temperatures in the majority of the interstellar space make it a very unfriendly environment for any kind of chemistry. Thus, the more complex molecules in the space have to be formed either in barrier-less ion-molecule reactions or reactions on ice/dust particles, which can adsorb reactant molecules on surfaces for long times.

In our laboratory, we can investigate the reactions on ice nanoparticles in a complex molecular-beam apparatus. Beams of different ice nanoparticles are produced in supersonic expansions. The nanoparticles fly isolated in vacuum and cool down by evaporation to typical temperatures of 10-100 K. Thus they represent good proxy for astronomical ices. As they pass through several pick-up cells, the nanoices can pick-up various gas-phase molecule on their surfaces. Then reactions can be triggered by photons (UV or IR) or electrons (fast, ~100 eV, causing ionization or slow, 0-10 eV, leading to the electron attachment), and we observe the reactions by mass spectrometry, velocity map imaging and other techniques.

Several examples of such investigations will be presented: pickup and coagulation of simple molecules on pure water-ice nanoparticles, generation of biologically relevant hydrogen bonds between molecules adsorbed on ices, ionization of doped ammonia ices, reactions of methanol and formic acid on ices, etc.