Colloquium

SFB 956

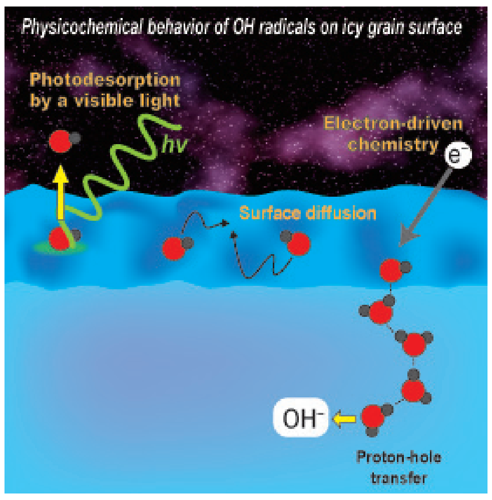
Conditions and Impact of Star Formation

19 July 2021

Monday 11:00 am

Physikalische Institute Köln

Video stream / Host: Stephan Schlemmer



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Monitoring of OH Radicals on Ice Surfaces at Low Temperatures: Diffusion and Proton-hole Transfer

The surface of cosmic ice dust is known as the birth place of various interstellar molecules in a very cold region in space, so-called a molecular cloud.
Because the temperatures of ice dust are typically as low as 10 K in molecular clouds, radical reactions having little barriers play dominant roles on the surface. However, because of intrinsic experimental difficulty in detecting radicals, little is known about the behaviors of radicals on the ice surface. On cosmic ice dust, hydroxyl (OH) radical is considered to be one of most abundant adsorbates. The OH radicals can be easily produced by photolysis of water ice and reaction of hydrogen and oxygen atoms. Recently, we have developed the method to monitor the OH radical on ice at very low temperatures, which can open a new phase of research on physicochemical processes of radicals. My presentation will consist of two topics: description of the OH detection method and information of OH adsorption sites; clarifying a proton-hole transfer in ice using that method.
The detection of OH radicals on ice can be achieved by a combination of photostimulated desorption and resonance-enhanced multiphoton ionization methods. The kinetic and internal energies of desorbed OH were measured.
From the results of experiments and quantum chemical calculations, we will discuss photodesorption mechanisms and adsorption sites of OH radicals on ice. Furthermore, information of surface diffusion of OH radicals on ice will be provided. We also focus on the behavior of OH radicals with coexistent of electrons on the ice surface. we found that once OH adsorbate captures an electron on the surface, the OH^- on the surface abstracts a proton from neighbouring H_2O which becomes OH^-. The sequence of this proton-hole transfer leads to the flow of negative current in ice.

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