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Institut für Ionenphysik
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Institutsseminar

Towards Cold, Controlled Ion-Neutral Reactivity

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The study of cold, controlled ion-neutral reactions is both of fundamental interest and has direct applications to fields ranging from astrochemistry to plasma reactors used in synthetic fuel generation. A wide range of different approaches have been developed, with Coulomb crystals offering the capability of studying ion-neutral reactions at very low kinetic temperatures. Coulomb crystals are periodic 3D structures formed of laser-cooled ions (in our case Ca+) that arise due to the equilibrium between the trapping fields and Coulombic repulsion. While many reactant ions of interest cannot be easily laser-cooled, multi-component crystals can be formed via inelastic collisions between the ions of interest and the laser-cooled species, allowing a vast range of target ions to be studied at low (<1 K) kinetic temperatures. Neutral reactants (with a focus on polar molecules and radicals) can then be introduced either via supersonic expansion or in combination with further velocity tuning and/or filtering. Recently, we developed a new instrument where our ion trap is maintained at cryogenic (<7 K) temperatures, allowing us to maintain internal state selectivity over the timescales needed for reactions. In addition to these measurements, we are also looking to develop novel ion generation approaches to provide greater control over the chemical structure of the reactants, and to target specific transient species of interest. In this talk I will outline some recent results, discuss some ongoing work, and identify some future challenges for the different projects in our lab.

HS G **15:30 Uhr** **30.10.2024**