



Innsbruck Physics Colloquium

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Cold Molecular Ions in Traps: From Precision Spectroscopy to Controlled Collisions

The recent progress in the preparation of neutral molecules and ions at extremely low temperatures has paved the way for a range of new research directions at the interface between chemistry and physics. Ensembles of cold, spatially localized (“Coulomb-crystallized”) atomic and molecular ions in traps are particularly attractive systems in this context in which it is possible to observe, manipulate and control single isolated particles under precisely controlled conditions [1].

In the presentation, we will give an overview of some applications of cold ions in the realm of molecular and chemical physics with recent examples from our work. We will discuss how single isolated molecules can be controlled on the quantum level which serves as a basis for upcoming molecular quantum technologies and precise measurements of molecular properties. We will then highlight experiments on chemical reactions between neutrals and ions at temperatures of a few millikelvin to illustrate exotic chemical processes that occur close to the absolute zero point of the temperature scale. Finally, we will present a new method to control chemical reactions of complex molecules by isolating distinct molecular conformations in an electric field and inducing their reaction with a localized reaction target of Coulomb-crystallized ions. The presentation will finish with an outlook on ongoing and future developments.

[1] S. Willitsch, *Int. Rev. Phys. Chem.* 31, 175 (2012)

Tuesday, 10.1.2017, at 17:15 h in lecture hall C

Innsbruck Physics Colloquium, Organisation: M. Beyer, R. Kissmann, H.-C. Nägerl, A. Reimer