

Physikalisches Kolloquium

Thursday, 25.05.2023, 16:15, HS 100

Reception with coffee & cookies 16:00

(For university staff: please bring your own cup for sustainability reasons)

Prof. Dr. Stefan Willitsch, University of Basel, Switzerland:

Quantum technologies for trapped molecular ions

Abstract

Molecules are quantum systems of prime significance in a variety of contexts ranging from physics over chemistry to biology. In spite of their importance, the development of quantum technologies for molecules has remained a long-standing challenge due to their complex energy-level structures. Trapped molecular ions are particularly attractive in this context as it is possible to observe, manipulate and control single isolated molecules under precisely controlled conditions. We will give an overview of the current state-of-the-art in the field of molecular-ion quantum technologies and highlight some salient applications. We will focus on recently developed quantum-non-demolition techniques for the non-destructive detection of the internal quantum states of single trapped molecular ions [1,2,3,4]. These approaches offer new perspectives not only for the detection, but also for the preparation and the manipulation of molecular quantum states on the single-particle level with a sensitivity several orders of magnitude higher compared to previous schemes. We will discuss applications of these techniques in the realms of precision molecular spectroscopy and chemistry [4,5].

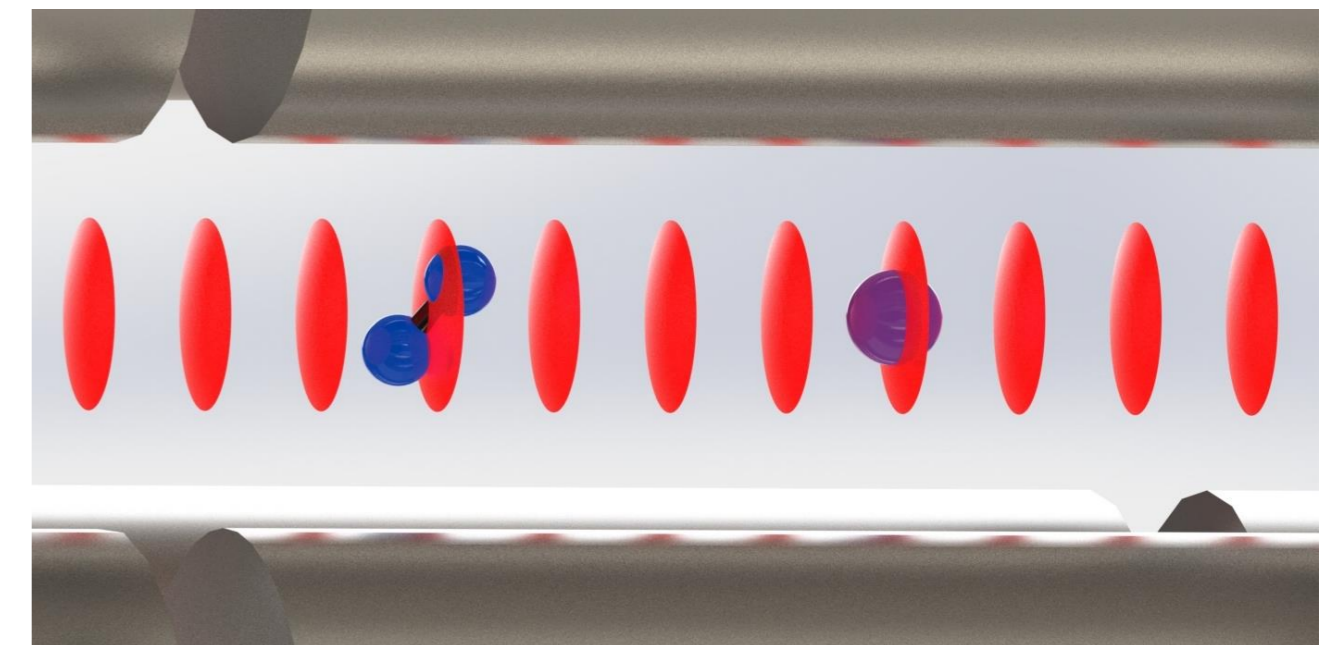
[1] M. Sinhal and S. Willitsch, arXiv: 2204.08814

[2] Z. Meir, G. Hegi, K. Najafian, M. Sinhal and S. Willitsch, *Faraday Discuss.* 217 (2019), 561

[3] M. Sinhal, Z. Meir, K. Najafian, G. Hegi and S. Willitsch, *Science* 367 (2020), 1213

[4] K. Najafian, Z. Meir, M. Sinhal and S. Willitsch, *Nat. Commun.* 11 (2020), 4470

[5] K. Najafian, Z. Meir and S. Willitsch, *Phys. Chem. Chem. Phys.* 22 (2020), 23083



All of you interested in physics are cordially invited!

Contact: Prof. Dr. Jochen Mikosch, Structural Molecular Dynamics, More Information: uni-kassel.de/go/physikalisches_kolloquium