IST AUSTRIA
Institute of Science and Technology

Physical Sciences Seminar

Stereodynamics of chemical reactions near absolute zero

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Host: Misha Lemeshko

I will present our work on fundamental aspects of low-energy gas-phase chemical reactions. In thepast years we have developed a method that allows us to merge two neutral supersonic expansionsusing inhomogeneous electric and/or magnetic fields.[1] We obtain state-purified samples ofpolarized atoms or molecules with well-defined velocities, which in turn offers highly controlledconditions for scattering experiments. In particular, the merged beam technique currently is theonly way to reach relative reactant velocities in molecular beams that correspond to collisionenergies under 1 K, opening doors towards the investigation of fundamental quantum mechanicaleffects in chemistry that are not visible at room temperature.We recently combined the merged beam technique with methods to orient reactants[2,3] andstudied, for the first time, sub-Kelvin stereodynamics in a prototypical energy transfer reaction,namely between metastable Ne(3P2) and ground state Ar atoms[4]. This reaction can proceed alongtwo pathways, one producing Ne(1S)+Ar++e- (called Penning ionization), the other one producingNeAr++e- (associative ionization). At high energies the branching ratio between these channels canbe controlled through the orientation of the Ne(3P2) atom, but this ability is lost at low energiesdue to a reorientation of the reactants.

[1] A. Osterwalder, EPJ Techniques and Instrumentation 2, 10 (2015).[2] J. Zou, S.D.S. Gordon, S. Tanteri, and A. Osterwalder, J. Chem. Phys. 148, 164310 (2018).[3] S.D.S. Gordon, J. Zou, S. Tanteri, J. Jankunas, and A. Osterwalder, Phys. Rev. Lett. 119, 053001 (2017).[4] S.D.S. Gordon, J.J. Omiste, J. Zou, S. Tanteri, P. Brumer, and A. Osterwalder, Nature Chemistry 43, 7279(2018).

Thursday, March 21, 2019 11:00am - 12:00pm

IST Austria Campus Mondi Seminar Room 2, Central Building

This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage: https://ist.ac.at/en/campus/how-to-get-here/ The IST Shuttle bus is marked IST Shuttle (#142) and has the Institute Logo printed on the side.