Taming beams of neutral molecules

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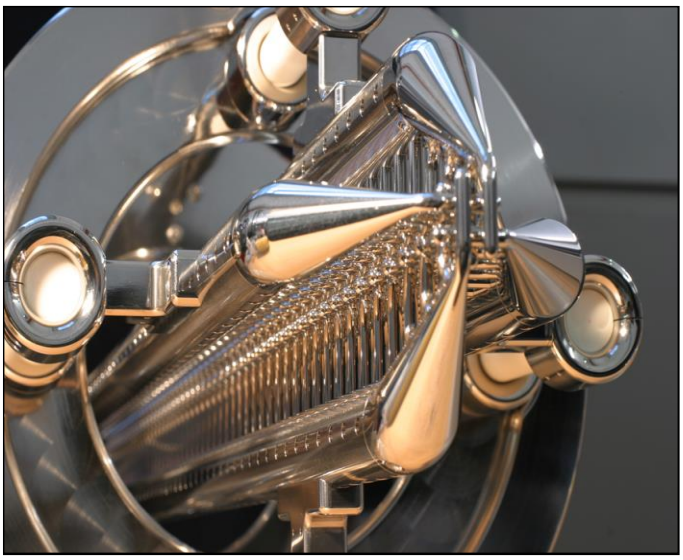
In this presentation, an overview will be given of the methods that have been developed to control the motion of neutral molecules with electric and magnetic fields [1]. These methods bear a lot of resemblance to the well-known methods used for the control of charged particles [2]. The neutral analogues of different types of linear accelerators (see a photograph of the so-called “Stark-decelerator” below), of a buncher, of a Paul trap, of a quadrupole mass-filter and of a synchrotron have all been demonstrated, and their operation principles will be described. An overview will be given of the possibilities that this molecular beam technology offers, ranging from ultrahigh-resolution spectroscopy and lifetime measurements to novel scattering experiments and the separation of structural isomers of (bio-)molecules. Time permitting, the progress towards the realization of a gas-phase molecular laboratory on a chip will be described.



References:

[1] S.Y.T. van de Meerakker, H.L. Bethlem, N. Vanhaecke, and G. Meijer, Chem. Rev. 112, 4828-4878 (2012).

[2] W. Paul, Angew. Chem. Int. Ed. Engl. 29, 739-748 (1990).