ALTERNATING GRADIENT FOCUSING AND DECELERATION OF LARGE MOLECULES

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During the last decade, fascinating progress has been made in the spectroscopy of the "molecular building blocks of life". Meanwhile, our group has been developing methods to decelerate neutral, polar molecules using time varying inhomogeneous electric fields. Extending these techniques to bio-molecules would allow, for instance, to increase observation times for precision spectroscopy or to separate different conformers. However, for such large molecules all states are practically high-field seeking. Therefore, alternating gradient focusing has to be applied[a]. Here, we demonstrate the focusing and deceleration of benzonitrile (C_7H_5N) from a molecular beam[b]. Benzonitrile is prototypical for large asymmetric top molecules that exhibits rich rotational structure and a high density of states. It is decelerated in its absolute ground state from 320 m/s to 289 m/s, and similar velocity changes are obtained for excited rotational states. We are setting up a longer alternating gradient decelerator, which will enable us to decelerate benzonitrile or larger molecules to much lower velocities and to thereby completely separate the decelerated packet from the rest of the beam pulse.

[a] H.L. Bethlem et al., *J. Phys. B* **39** (2006), R263
[b] K. Wohlfart et al., *submitted to Phys. Rev. A*