

Abstract Submitted
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Controlled Ensembles of Formaldehyde Molecules at Ultracold Temperatures MARTIN ZEPPENFELD, ALEXANDER PREHN, MARTIN IBRÜGGER, ROSA GLÖCKNER, GERHARD REMPE, MPI for Quantum Optics — Applications of ultracold molecules such as quantum information processing and quantum controlled chemistry require the preparation of ultracold molecule ensembles with a high level of control over all molecular degrees of freedom. Due to the inability to apply standard atom cooling techniques such as laser cooling to most molecule species, developing new methods is essential. We present a toolbox of techniques developed in our group for controlling molecules. A microstructured electric trap allows us to trap molecules in predominantly homogeneous electric fields with trapping times of up to a minute^{1,2}. Optical pumping on a vibrational transition allows us to transfer the population from a large number of rotational states to a single rotational M -sublevel³. Our experiment provides excellent conditions for precision spectroscopy and investigation of ultracold collisions.

¹B.G.U. Englert et al., Phys Rev. Lett. **107**, 263003 (2011).

²A. Prehn et al., arXiv: 1511.09427 [physics.atom-ph] (2015).

³R. Glöckner et al., Phys. Rev. Lett. **115**, 233001 (2015).

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