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Stopping intense beams of internally cold molecules via centrifugal forces XING WU, THOMAS GANTNER, MARTIN ZEPPENFELD, SOTIR CHERVENKOV, GERHARD REMPE, Max-Planck-Institute of Quantum Optics — Cryogenic buffer-gas cooling produces intense beams of internally cold molecules [1]. It offers a versatile source for studying collision dynamics and reaction pathways in the cold regime, and could open new avenues for controlled chemistry, precision spectroscopy, and exploration of fundamental physics. However, an efficient deceleration of these beams still presents a challenge. Here, we demonstrate that intense and continuous beams of electrically guided molecules produced by a cryogenic buffer-gas cell [2] can be brought to a halt by the centrifugal force in a rotating frame [3]. Various molecules (e.g. CH_3F and CF_3CCH) are decelerated to below $20 m/s$ at a corresponding output intensity of $\sim 6\times10^9 mm^{-2}\cdot s^{-1}$. In addition, our RF-resonant depletion detection shows that up to 90% rotational-state purity can be achieved in the so-produced slow molecular beams.

[1]J. D. Weinstein et al., Nature 395, 148 (1998)
[2]L.D. van Buuren et al., Phys. Rev. Lett. 102, 033001 (2009)
[3]S. Chervenkov et al., Phys. Rev. Lett. 112, 013001 (2014)

Xing Wu
Max-Planck-Institute of Quantum Optics

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