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Optical cycling, radiative deflection, and laser cooling of metal monohydride molecules REES MCNALLY, QI SUN, IVAN KOZYRYEV, SEBASTIAN VAZQUEZ-CARSON, KONRAD WENZ, TIANLI WANG, TANYA ZELEVINSKY, Columbia University — The past decade has seen major advances in direct laser cooling of diatomic and even polyatomic molecules, including trapping of ultracold samples for several species. A critical requirement for direct laser cooling is the demonstration of sustained optical cycling without loss to dark states, and control over the molecules spatial degrees of freedom using laser light. Here we present the first demonstration of optical cycling, radiative deflection, and Sisyphus cooling for barium monohydride molecules (BaH). This adds a new class of diatomic molecules, the alkaline earth monohydrides, to the rapidly expanding set of laser cooled molecules. Optical cycling rates are measured via depletion of the ground vibrational state and deflection of the molecular beam. Our results are consistent with the maximum scattering rate obtainable, based on a simulation of the Lindblad master equation for the complete system. Sisyphus cooling was carried out along one transverse dimension of a cryogenic buffer gas beam. Prospects for confinement in a magneto-optical trap will be discussed. We will also present preliminary results on optical cycling and manipulation of CaH, a lighter alternative to BaH.

Rees McNally
Columbia Univ

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