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Progress on optical loading and laser cooling of the polyatomic molecule SrOH LOUIS BAUM, IVAN KOZYRYEV, KYLE MATSUDA, BOERGE HEMMERLING, JOHN M. DOYLE, Department of Physics, Harvard University, Harvard-MIT Center for Ultracold Atoms — Polyatomic molecules hold promise for discovery of new physics and chemistry due to their rotational and vibrational degrees of freedom. We are approaching the production of ultracold SrOH by using buffer-gas cooling and optical manipulation. We report on the production of a cold and slow cryogenic buffer-gas beam [1] of SrOH containing 10^9 molecules per pulse of length a few ms with a peak forward velocity of 60 m/s and a velocity spread of 40 m/s. Using this beam, we have successfully demonstrated multiple-photon scattering on the $X^2\Sigma^+$-$A^2\Pi_{1/2}$ transition, which is a crucial step towards implementing laser cooling of a polyatomic. As a first application, we plan to use transverse laser cooling to decrease the intrinsic divergence of the beam source. We report on the progress towards optical loading such an enhanced, collimated beam of SrOH into a magnetic trap for studying atom-molecule collisions and exploring the possibility of sympathetic cooling for polyatomics with alkali atoms.

[1] Hutzler, Nicholas R., Hsin-I. Lu, and John M. Doyle. "The buffer gas beam: An intense, cold, and slow source for atoms and molecules." Chemical Reviews 112.9 (2012): 4803-4827.

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