SPECTROSCOPY ON ALUMINUM MONOCHLORIDE (ALCL) FOR LASER COOLING AND TRAPPING

JOHN DANIEL, KAYLA RODRIGUEZ, *Physics and Astronomy, University of California, Riverside, Riverside, CA, USA*; TAYLOR LEWIS, *Department of Chemistry, University of California, Riverside, Riverside, CA, USA*; SHANE P KELLY, *Physics and Astronomy, University of California, Riverside, Riverside, CA, USA*; ALEXANDER TEPLUKHIN , BRIAN K KENDRICK, *Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM, USA*; CHRISTOPHER BARDEEN, *Department of Chemistry, University of California, Riverside, Riverside, CA, USA*; SHAN-WEN TSAI, BOERGE HEMMERLING, *Physics and Astronomy, University of California, Riverside, Riverside, CA, USA*.

Cooling atoms to the ultracold regime has allowed for studies of physics, ranging from many-body physics of quantum degenerate gases, quantum computing, precision measurements and tests of fundamental symmetries. Extending these experiments to polar molecules has the prospect of enhancing the sensitivity of such tests and of enabling novel studies, such as cold controlled chemistry. However, applying traditional laser cooling techniques to molecules is rendered difficult due their additional degrees of freedom which result in a limited photon scattering budget. Here we study aluminum monochloride (AlCl) as a promising candidate for laser cooling and trapping. The cooling transition at 261 nm ($A^1\Pi - X^1\Sigma^+$) has an estimated Franck-Condon factor of 0.9988 which allows for scattering 800 photons with a single laser before the molecule enters an excited vibrational state. We use a frequency-tripled (SHG + SFG) Titanium-Sapphire laser. We generate AlCl via laser ablation of $AlCl_3$ in a cryogenic helium buffer gas beam source and we will discuss initial spectroscopy on AlCl necessary for future laser cooling and trapping.