Production and Trapping of Ultracold Polar Molecules

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— Recently we have demonstrated the production of a sample of ultracold, polar RbCs molecules in their absolute vibronic ground state. The sample has a translational temperature of $100 \mu K$ and a narrow distribution of rotational states. The molecules are initially formed from laser-cooled $^{85}\text{Rb}$ and $^{133}\text{Cs}$ atoms via photoassociation, resulting in short-lived, vibronically excited RbCs molecules. A fraction of these excited molecules subsequently spontaneously decay to ground electronic states, populating many excited vibrational levels. We then transfer the population of one of these levels, $a^3\Sigma^+ (v = 37)$, to the absolute vibronic ground state via a pump-dump scheme. We discuss progress toward observing strong, anisotropic collisions between these molecules through trapping them using a quasi-electrostatic trap (QUEST). We will also discuss our progress in implementing a Stimulated Adiabatic Raman Passage scheme to improve the transfer process to the vibronic ground state.

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