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Creating and confining ultracold polar molecules¹

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We describe our work on the creation of ultracold ($T \sim 200 \mu\text{K}$) NaCs molecules. Our experiments start with electronic ground-state NaCs molecules created by photoassociation of laser cooled and trapped Na and Cs atomic vapors held in a two-species magneto-optical trap. Using state-resolved photoassociation followed by resonantly enhanced multi-photon ionization we have carried out a detailed spectroscopic study of this system and show that a significant number of deeply bound singlet-state molecules can be created. We then describe our recent success in trapping the singlet molecules. Finally, we discuss approaches to manipulate the state of these molecules using a laser-controlled state transfer scheme.

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