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Pulsed Laser Depletion Spectroscopy of Ultracold NaCs Molecules PATRICK ZABAWA, AMY WAKIM, AMANDA NEUKIRCH, NICHOLAS BIGELOW, University of Rochester, ELENA PAZYUK, ANDREY STOLYAROV, Moscow State University, MARIS TAMANIS, RUVIN FERBER, University of Latvia — We have labeled several deeply bound vibrational quanta in the $X^1\Sigma^+$ electronic state in a sample of ultracold NaCs ($\sim$200 μK). The molecules are prepared from Magneto-Optical Traps (MOTs) via photoassociation with a laser field detuned from the Cs $6^2S_{1/2} - 6^2P_{3/2}$ transition. We illuminate the sample with a tunable depletion pulse from a pulsed dye laser $\sim$100 μs before a Resonance Enhanced Multi-Photon Ionization (REMPI) detection pulse. By leaving the REMPI pulse frequency fixed, and scanning the depletion pulse frequency, we observe the vibrational progression of the excited electronic state from a single ground vibrational level. This technique allows us to scan large portions of the spectrum ($\sim$30 nm for a single laser dye) very quickly and with great efficiency, though with lower resolution ($\sim$1 cm^{-1}) than the CW depletion method. With this technique we have also observed the dissociation limit of NaCs above the Cs $6^2P_{3/2}$asymptote, which allows an independent verification for binding energies. An analysis of these spectra indicates the presence of $X^1\Sigma^+$ molecules in the $\nu = 4$, 5, 6, 9, 10, 11, 19 vibrational states.

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