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**Creation of Ultracold Dipolar Ground State Molecules of $^{23}\text{Na}^{40}\text{K}$**

SEBASTIAN WILL, JEE WOO PARK, JENNIFER SCHLOSS, ZOE YAN, HUAN-QIAN LOH, MARTIN ZWIERLEIN, Massachusetts Institute of Technology — Over the past decade ultracold atomic quantum gases have successfully been employed as quantum simulators to gain a better understanding of strongly correlated many-body systems. However, the dominant interactions between atoms are typically short-range in character, limiting the spectrum of quantum phenomena to be explored. Quantum particles with long-range dipolar interactions will open new routes for quantum simulation and promise the creation of novel states of matter, such as quantum crystals, topological superfluids and supersolids. Ultracold heteronuclear molecules offer a unique path to realize a strongly dipolar quantum gas. Among several choices, NaK stands out as an exceptional molecule due to its chemical stability and a large electric dipole moment in its absolute ground state. We report on recent progress that led us to the creation of the first ultracold, strongly dipolar molecules of NaK. Using a two-photon STIRAP process we have efficiently transferred NaK from the Feshbach state to the rovibrational ground state. By applying an external electric field, we have aligned the molecular dipoles, inducing long-range dipolar interactions. These advances bring the creation of novel states of matter in a strongly dipolar quantum gas of NaK into experimental reach.

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