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Ultracold polar molecules

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Ultracold quantum gases are model systems for studying many-body quantum physics. For example, superfluidity in ultracold Fermi gases of atoms realizes an electrically neutral analog of superconductivity. Recently, enormous progress has been made toward the goal of creating a new type of quantum gas where the constituent particles are polar molecules rather than atoms. In addition to new internal degrees of freedom of the particles, polar molecules introduce the possibility of long-range dipole-dipole interactions, which make the system fundamentally different from atom gases, which have short-range, or contact, interactions. I will discuss recent experimental work on a trapped gas of ultracold fermionic polar molecules.