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Magneto-optical Trapping of a Diatomic Molecule

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The magneto-optical trap (MOT) is the workhorse technique for atomic physics in the ultracold regime, serving as the starting point in applications from optical clocks to quantum-degenerate gases. Although MOTs have been used with a wide array of atomic species, realization of a molecular MOT was long considered infeasible. In this talk we will describe the first magneto-optical trap for a molecule, strontium monofluoride (SrF). Our MOT produces the coldest trapped sample of directly-cooled molecules to date, with temperature T $\sim$2.5 mK. The SrF MOT is loaded from a cryogenic buffer-gas beam slowed by laser radiation pressure. Images of laser-induced fluorescence allow us to characterize the trap's properties. Although magneto-optical trapping of diatomic molecules is in its infancy, our results indicate that access to the ultracold regime may be possible for several molecular species, with potential applications from quantum simulation to tests of fundamental symmetries to ultracold chemistry.