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Degenerate gases of strontium in optical lattices SIMON STELLMER, BENJAMIN PASQUIOU, RUDOLF GRIMM, FLORIAN SCHRECK, Institut für Quantenoptik und Quanteninformation (IQOQI) — Ultracold strontium atoms are subject to active research due to properties not present for alkali atoms. Our recent achievements of quantum degeneracy of all existing bosonic and fermionic isotopes allow for a wide variety of experiments. Insensitivity to external fluctuations, long lifetime metastable states, and decoupling of the nuclear spin from the electronic state make strontium an ideal candidate for quantum computation processes. This system can also be used to implement quantum simulation of many-body effects: strontium atoms exhibit SU(N) symmetry, as their collisional properties are spin-independent, and can therefore be used to study SU(N) magnetism effects, such as the implementation of the Kondo lattice model or the observation of spin liquids. Here we report on the improved production of degenerate gases of all strontium isotopes. Moreover, we report on the creation of various doubly-degenerate Bose-Bose and Bose-Fermi mixtures of strontium isotopes. We present the adiabatic loading of strontium BEC in a 3D optical lattice into the Mott insulator regime. We also report on the loading of degenerate multi-component Fermi seas of up to 10 spin states in optical lattices, and observe the appearance of the Mott insulator regime for these systems.

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