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Ultracold Mixtures and Molecules from Ytterbium and Lithium ANDERS HANSEN, ALEXANDER KHRAMOV, WILLIAM DOWD, ALAN JAMISON, VLADYSLAV IVANOV, FRANK MÜNCHOW, SUBHADEEP GUPTA, University of Washington — Ultracold mixtures composed of different atomic species offer unique opportunities for probing few and many-body physics, including studies of mass-mismatched Efimov physics, impurity probes of superfluid properties, and mass-imbalanced interactions. Furthermore, the possibility of producing heteronuclear, polar molecules through field-induced scattering resonances enables a large set of experiments involving dipolar quantum matter and tests of fundamental physics. We outline our experimental setup and techniques to synthesize molecules from ultracold gases of atomic lithium and ytterbium. We report on the production of a stable mixture of ^{6}Li and ^{174}Yb confined in a common far-off-resonant optical trap. Through studies of inter-species thermalization rates, we have extracted the s-wave scattering length $|a_{^6Li-^{174}Yb}|$. Furthermore, through forced evaporation of ^{174}Yb, we have sympathetically cooled ^{6}Li to below the Fermi temperature. We will discuss experimental progress towards searches for inter-species Feshbach resonances, the synthesis of polar molecules, and studies of the BEC-BCS crossover in ^{6}Li using ^{174}Yb as an impurity probe.

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