Collisional properties of an ultracold K-Rb mixture

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We investigate the interspecies collisional properties of an ultracold $^{41}$K-$^{87}$Rb mixture, stored in a magnetic trap. The potassium sample is cooled by means of thermal contact with the evaporatively cooled rubidium [1]. We determine magnitude and sign of the $^{41}$K-$^{87}$Rb triplet scattering length by investigating the behavior of the cross-section for elastic collisions with temperature, in samples composed by atoms in the $|F = 2, M_F = 2\rangle$ state. In particular, we obtain a positive scattering length: $a_t=163^{+72}_{-12} \ a_0$. We also measure the singlet scattering length from inelastic collisional rates in a mixture of $|2, 2\rangle$ and $|2, 1\rangle$ states. In addition, we present the triplet scattering lengths for all the K-Rb isotope pairs, as determined through mass scaling, and we discuss the implications for creating other ultracold K-Rb mixtures.

Our determination of a repulsive $^{41}$K-$^{87}$Rb triplet interaction is confirmed by the observation of a stable binary Bose-Einstein condensate. We will report on further collisional investigation in progress on the binary condensate.