Feshbach spectroscopy of ^{39}K-Cs, and ^{41}K-Cs mixtures

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We present recent results of Feshbach spectroscopy in ultracold mixtures of cesium and bosonic potassium isotopes, ^{39}K and ^{41}K, performed in a single-chamber vacuum system. For the ^{39}K–Cs mixture, we provide an independent verification of previously reported Feshbach resonances and report ten additional resonances observed for the first time [1]. A novel detection scheme employing Stern–Gerlach spin separation enables simultaneous monitoring of all potassium spin components, significantly improving data acquisition efficiency.

Building on this benchmark system, we extend the study to the less abundant ^{41}K–Cs mixture. Here, we observe substantial heteronuclear losses, limiting the sample lifetime to $\tau \approx 250$ ms. A total of 19 Feshbach resonances are identified and assigned to specific collision channels using the same detection method. Interestingly, the observed resonance positions deviate by up to 30 G from theoretical predictions based on the K–Cs interaction potentials refined by the ^{39}K–Cs spectroscopy [1]. These findings highlight the need for further refinement of the molecular interaction potentials and represent a promising step toward the formation of ultracold ground-state ^{39,41}KCs molecules.

References

[1] M. Gröbner *et al.*, *Observation of interspecies Feshbach resonances in an ultracold* ^{39}K-^{133}Cs *mixture and refinement of interaction potentials*, Phys. Rev. A **95**, 022715 (2017).