Invited talk

Creation of ultracold triatomic molecules

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Ultracold assembly of diatomic molecules has enabled great advances in controlled chemistry, ultracold chemical physics, and quantum simulation with molecules. Extending the ultracold association to triatomic molecules will offer many new research opportunities and challenges in these fields. A possible approach is to form triatomic molecules in a mixture of ultracold atoms and diatomic molecules. I will talk about our recent work on the creation of ultracold triatomic molecules near the Feshbach resonance between ^{23}Na^{40}K molecules in the rovibrational ground state and ^{40}K atoms. We use radio-frequency association[1] and magnetoassociation[2] to form weakly bound triatomic Feshbach molecules. Moreover, we form deeply bound triatomic molecules in electronic excited states using Feshbach-enhanced photoassociation[3]. Our work contributes to the understanding of the complex spectroscopy of ultracold triatomic molecules and opens up an avenue toward bottom-up construction of ultracold polyatomic molecules.

[1]H. Yang *et al.*, *Nature* **602**, 229 (2022).
[2]H. Yang *et al.*, *Science* **378**, 1009 (2022).
[3]J. Cao *et al.*, *Phys. Rev. Lett.*, **132**, 093403 (2024).