



# Infrared Spectroscopy of $\text{CH}_5^+$ and Radical-Cations in Helium Nanodroplets

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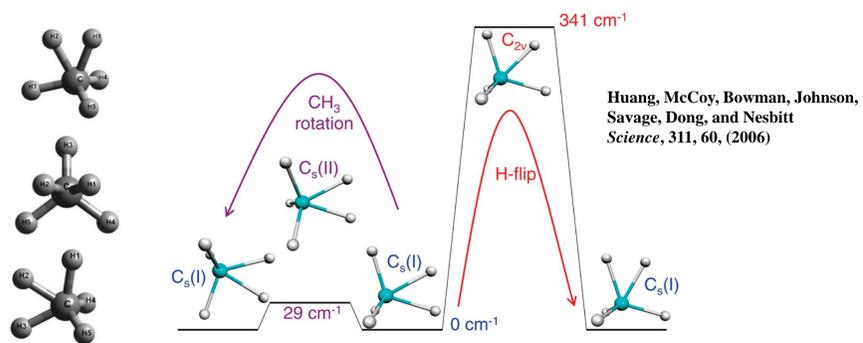
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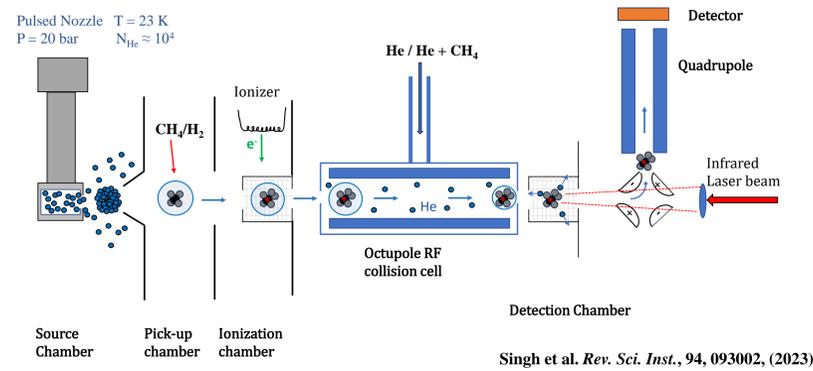
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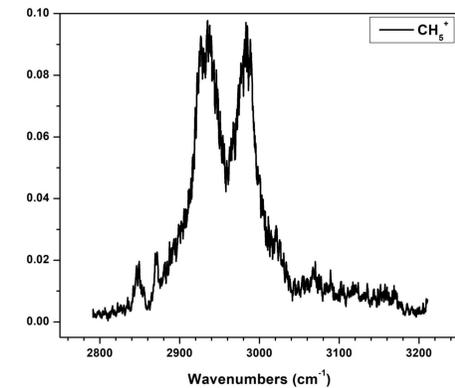
## $\text{CH}_5^+$ Structure



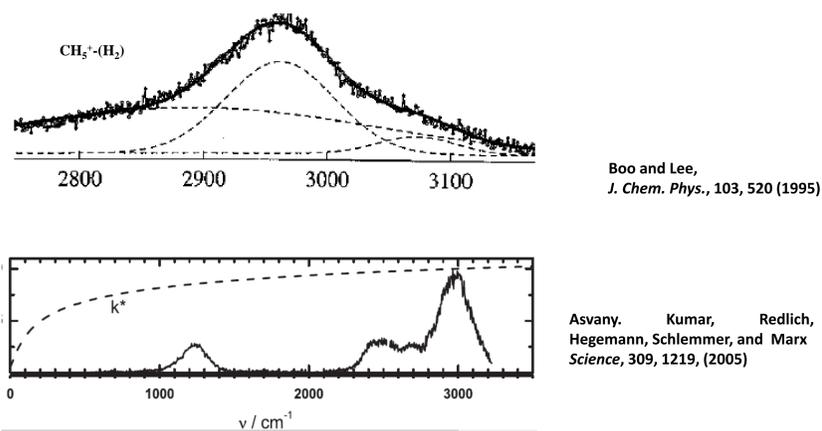
## Spectroscopy in Helium Droplets



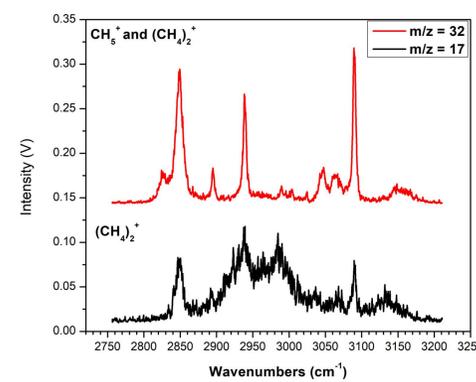
## $\text{CH}_5^+$ Spectra from Protonation



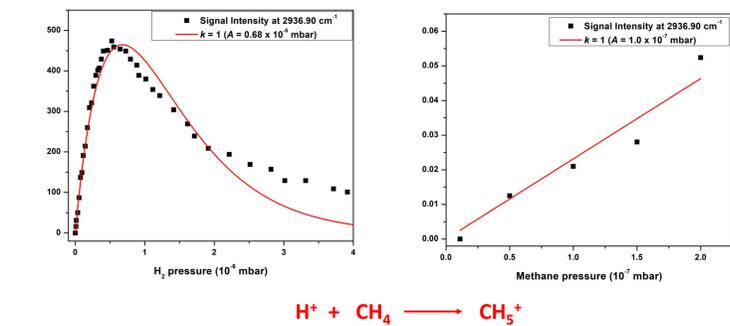
## Previous Low-Resolution Spectra



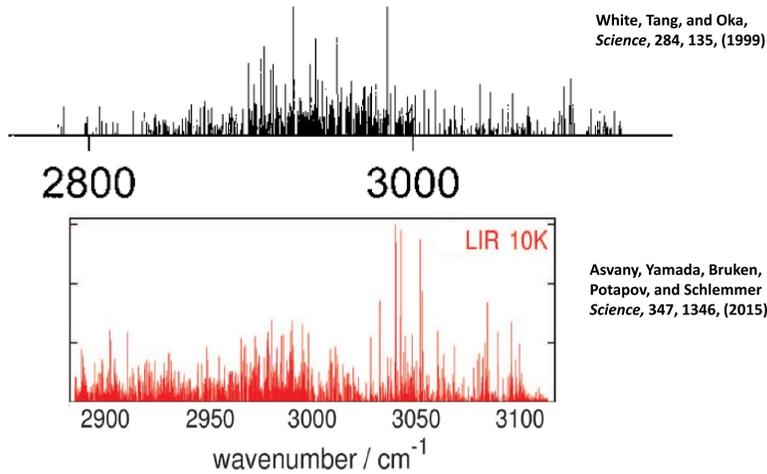
## Spectra of $\text{CH}_5^+$ and $(\text{CH}_4)_2^+$ Upon $(\text{CH}_4)_2$ ionization



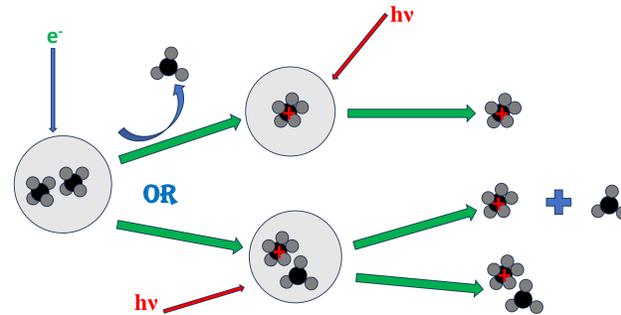
## Pressure Dependence on Signal Intensity



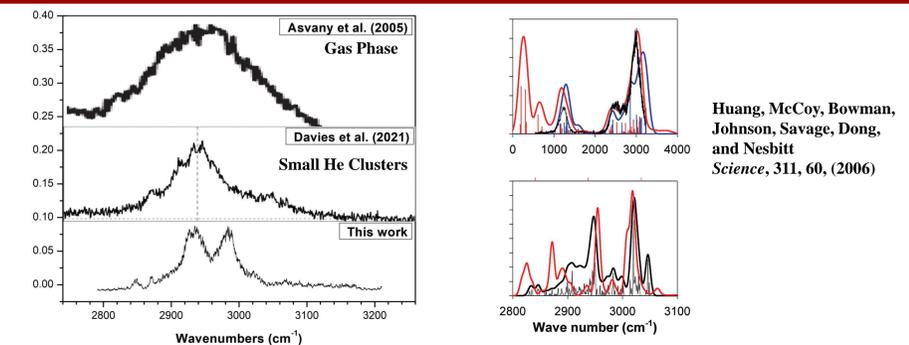
## Previous High-Resolution Spectra



## Ionization and Laser Fragmentation

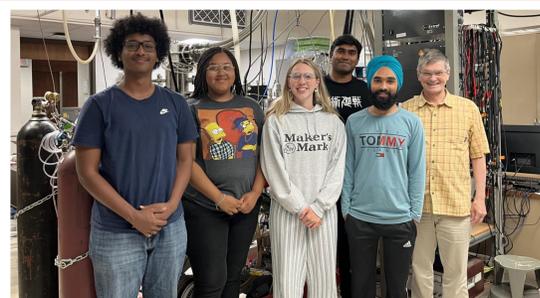


## Comparison with Previous Work



## Acknowledgements

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  - Tom Bernaards
  - Prakashraj Nehrudass
  - Stefan Bergmeister
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## Conclusions

- The  $\text{CH}_5^+$  ions in Helium droplets were produced by electron impact ionization of  $(\text{CH}_4)_2$  and by protonation of  $\text{CH}_4$
- Two partially resolved bands for  $\text{CH}_5^+$  are observed
- Helium droplets are useful host to produce and study novel radical cation clusters ( $(\text{CH}_4)_N^+$ ,  $(\text{H}_2\text{O})_N^+$ ,  $(\text{NH}_3)_N^+$ , etc.
- More Theory required for the band assignments