**Helium-Tagged Molecular Ions**

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Our latest findings on helium-tagged molecular ions will be presented. As this is an 'introductory talk', it will be shown how these ions are produced by electron ionization of molecule-doped helium nanodroplets and then probed using infrared photodissociation spectroscopy, using essentially a standard helium nanodroplet/laser spectroscopy setup. The focus will then switch to small ions and how their spectroscopic properties change as the number of helium atoms added is altered. This will include the ions $H_3O^+$, $H_2O^+$ and $CH_3^+$. All three ions show significant changes in their spectra as the number of helium atoms is varied. This is most dramatic in the case of $H_3O^+$, where the two rotational constants of the core molecular ion undergo a reversal in magnitude as the number of helium atoms is increased. This rotational decoupling response appears to be related to shell closures of the helium around the $H_3O^+$ and, as will be shown, hybrid path integral molecular dynamics/Monte Carlo calculations can reproduce this behaviour quite accurately.

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