

Seminar

Toward the first pure gas-phase spectroscopy of C₆₀⁺ in true interstellar conditions

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One of the long-standing mysteries in astronomy is the origin of the interstellar absorption features that are observed in the visible to near infrared range of the electromagnetic spectrum and are dubbed as the diffuse interstellar bands (DIBs). Despite the observation of several hundred lines over nearly a century, none of them has been conclusively attributed to a known chemical species until last year, when four of these lines were found to be caused by C₆₀⁺. Our objective is to carry out the first pure gas-phase spectroscopy of C₆₀⁺ using a cryogenic ion-beam trap that simulates true interstellar environment. The stored molecular ions will be subject to excitation by near-infrared laser light spanning the range of the absorption features of C₆₀⁺. At resonance, the absorbed energy is expected to be re-distributed among the vibrational modes of the molecule followed by the delayed emission of mid-infrared radiation. A fraction of the emitted light will be guided onto highly sensitive blocked impurity band (BIB) detectors which feature extremely low dark current and high sensitivity. After the proof-of-principle experiments with C₆₀⁺, this novel spectroscopy scheme will be used for a wide range of other complex organic molecular ions like, e.g., polycyclic aromatic hydrocarbons, which are proposed to be the carriers of the DIBs. The measurement scheme, preparatory work toward its implementation, and the current state of the experimental setup will be presented.

Tuesday, Mar 22nd 2016

4:00 PM (Tea/Coffee at 3:45 PM)

Seminar Hall, TCIS