REMPI ELECTRONIC SPECTRA OF HIGHLY UNSATURATED HYDROCARBONS

H. DING, A. E. BOGUSLAVSKIY, T. W. SCHMIDT, T. PINO and J. P. MAIER, *Department of Chemistry, University of Basel, Klingelbergstrasse 80, CH-4056, Basel, Switzerland.*

The carbon chains C_nH (n=2-6) and $HC_{2n}H$ (n=1-3) have been detected in the interstellar medium (ISM). The long chains $HC_{2n}H$ and HC_{2n+1} H also are expect4ed to exist in the ISM. They are considered key molecules in the carbon-chain growth in ISM and are as potential candidates of the diffuse interstellar bands (DIBs).

The visible and UV electronic spectra of the highly unsaturated hydrocarbons: $C_{2n+1}H$ (n=1-4), even chains $HC_{2n}H$ (n=2-13), odd chains $HC_{2n+1}H$ (n=3-6,9) and C_nH_m (n>m>3) as well as bare carbon cluster C_{18}, have been investigated by a mass-selective resonant two-color two-photon ionization technique in a supersonic molecular beam using a pulsed electronic discharge source and laser ablation source.

The electronic spectra of $C_{2n+1}H$ reveal a rich and complicated vibronic structure in the visible and are assigned to several electronic transitions of linear to bent or linear to linear structures. The $HC_{2n}H$ electronic spectra are assigned to four electronic transition systems, consisting of two dipole-forbidden, a strong valence to valence and one valence to Rydberg transition. The $HC_{2n+1}H$ electronic spectra consist of three dipole-allowed transition systems, located in visible, UV, and VUV spectral range. The transition energies of the all of valence to valence transition systems decrease monotonically with the chain size, but not for the valence to Rydberg transition systems. The astronomical implications are discussed and the upper limit of the column density is estimated for these highly unsaturated hydrocarbons in diffuse clouds.