Electronic Absorption Spectroscopy of Matrix Isolated Polycyclic Aromatic Hydrocarbon Ions. Contribution to Astrophysical Issues

F. Salama, *NASA-Ames Research Center, MS 245-6, Moffett Field, CA 94035.*

We have undertaken a series of experiments in which PAHs are isolated at 4.2 K in a Ne matrix and exposed to VUV irradiation. These experiments mimic the low temperature and density prevailing in the diffuse interstellar medium as well as the irradiation flux and offer a practical means to determine the spectroscopic properties of isolated PAH ions. A condition critical to the astrophysical application. This report will describe the results obtained with the smaller PAH candidates (up to coronene). The absorption spectra (180-900 nm range) of the molecular cations formed in a Ne matrix under VUV irradiation of the neutral precursor are reported together with the spectroscopic assignment of the associated vibronic band systems and their oscillator strengths.
The potential contributions as well as limitations of MIS to long standing, unresolved problems in astrophysics are highlighted and illustrated with the results obtained on small PAH ions. Based on these preliminary results, we can now address the issue of gas phase measurements. We discuss the potential experimental approaches wich could be used to probe the electronic/vibronic states of large aromatic ions.

References: F. Salama in Low Temperature Molecular Spectroscopy, R. Fausto ed., NATO/ASI Series, Kluwer Acad. Pub., in press (1996); F. Salama, C. Joblin and L. Allamandola, J. Chem. Phys. 101, 10252 (1994); F. Salama and L. J. Allamandola, Nature 358, 42 (1992); ibid, J. Chem. Phys. 94, 6964 (1991).