INTERSTELLAR ORGANICS AND POSSIBLE CONNECTIONS WITH THE CARBONACEOUS COMPONENTS OF METEORITES AND IDPs; L. J. Allamandola, NASA Ames Research Center, MS:245-6, Moffett Field, CA 94035-1000

Studying the chemical and isotopic composition of interstellar ice and dust provides insight into the composition and chemical history of the solid bodies in the solar nebula and the nature of the material subsequently brought into the inner part of the solar system by comets and meteorites. It is now possible to probe the composition of these microscopic interstellar particles (some hundreds of light years away), thanks to substantial progress in two areas: astronomical spectroscopic techniques in the middle-infrared, the spectral region most diagnostic of composition; and laboratory simulations which realistically reproduce the critical conditions in various interstellar environments.[1] High quality infrared spectra of many different astronomical sources, some associated with dark molecular clouds, and others in the diffuse interstellar medium (DISM) are now available. What comparisons of these spectra with laboratory spectra tell us about the complex organic components of these materials is the subject of this talk.

Most interstellar material is concentrated in large molecular clouds where simple molecules are formed by gas phase and dust grain surface reactions. Gaseous species (except H_2) striking the cold (10K) dust will stick, forming an icy grain mantle. This accretion, coupled with energetic particle bombardment and UV photolysis, will produce a complex chemical mixture containing volatile, non-volatile, and isotopically fractionated species. One can compare spectra of the diffuse and dense interstellar medium with the spectra of analogs produced in the laboratory under conditions which mimic those in these different environments. In this way one can determine the composition and abundances of the major constituents present and place general constraints on the types and relative abundances of organics coating the grains. Ices in dense clouds contain H_2O, CH_3OH, CO, perhaps some NH_3 and H_2CO, as well as nitriles and ketones or esters. There is some evidence that the later, more complex species, are also present on the grains in the DISM. The evidence for these materials, in addition to carbon rich materials such as amorphous carbon, microdiamonds, and polycyclic aromatic hydrocarbons will be reviewed and the possible connection with meteoritic organics will be discussed.

1 Allamandola, L.J., and Tielens, A.G.G.M., (1989) eds., Interstellar Dust (Kluwer, Dordrecht).