



## Abstract

Infrared spectroscopic observations of the stretching and bending modes of aliphatic and aromatic compounds are now seen throughout the Universe, from the diffuse interstellar medium of the Milky Way Galaxy to distant galaxies. Observations of evolved stars have revealed a rapid ( $\sim 10^3$  year time scale) and continuous synthesis of organic materials from the end of the asymptotic giant branch (AGB), to proto-planetary nebulae, to planetary nebulae. These synthesized products are ejected into the interstellar medium through stellar winds and as a result enriching the Galaxy with complex organics.

Over 70 gas-phase molecules, including rings, radicals, and molecular ions, as well as fullerene ( $C_{60}$ ) have been identified by millimeter-wave and infrared spectroscopic observations through their rotational and