

The Synthesis of Inorganic and Organic Compounds in the Late Stages of Stellar Evolution

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Abstract

Recent observations by the Infrared Space Observatory (ISO) have found evidence of rapid synthesis of complex organic molecules in the late stages of stellar evolution. The chemical synthesis begins with the formation of acetylene, the first building block of benzene, in carbon stars. In a following proto-planetary nebulae stage, emission features corresponding to stretching and bending modes of aliphatic compounds are detected. When these objects evolve to become planetary nebulae, aromatic C-H and C-C stretching and bending modes become strong. These results show that complex carbonaceous compounds can be produced in a circumstellar environment over a period of only a few thousand years.

Analysis of meteorites and interplanetary dust collected in the upper atmospheres have revealed the presence similar compounds, raising the possibility that the early solar system was chemically enriched by ejecta from evolved stars.

In this talk, we will summarize the history of astronomical infrared spectroscopy in the last 30 years, discuss the formation of solid-state inorganic and organic compounds in stars, and speculate on the possible implications of these products on the formation of the solar system.