

Laboratory Studies on the Formation of Carbon-Bearing Molecules in Extraterrestrial Environments From the Gas Phase to the Solid State

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Abstract

A detailed knowledge of the formation of carbon-bearing molecules in interstellar ices and in the gas phase of the interstellar medium is of paramount interest to understand the astrochemical evolution of cold molecular clouds, circumstellar envelopes, and of star-forming regions. Since the present composition of each interstellar environment reflects the matter from which it was formed and the processes which have changed the chemical nature since the origin (cosmic ray exposure, photolysis, chemical reactions), a detailed investigation of the physico chemical mechanisms altering the pristine environment is of paramount importance to understand the contemporary composition. Once these underlying processes have been unraveled, we can identify those molecules, which belonged to the nascent setting, distinguish molecular species synthesized in a later stage, and predict the imminent chemical evolution of, for instance, molecular clouds. This talk overviews the experimental setups utilized in the current experiments (surface scattering machine, crossed beams machine) and portrays then typical results of each setup (formation of aminoacids, aldehydes, alcohols, epoxides; synthesis of hydrogen terminated carbon chains as precursors to complex PAHs and to carbonaceous dust grains in general). These laboratory results can predict then where in the interstellar medium complex, carbon bearing molecules can be formed on interstellar grains and in the gas phase.

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