

Observation and Photodesorption of Complex Organic Molecules from Soft X-ray Irradiated H₂O:CO:NH₃ ice mixtures

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Abstract

The observation of some complex organic molecules, such as CH₃CN, HCONH₂, and CH₃NCO, is investigated through the soft X-ray (250–1250 eV) irradiated H₂O:CO:NH₃ ice mixtures. X-ray irradiation plays a vital role for the prebiotic chemistry in the protostellar and circumstellar regions since it can penetrate to a deeper region. These N-bearing species are extremely interested in since they are prebiotic relevance, which has been detected in the above astrophysical regions. During X-ray irradiation, the secondary electrons interact with the ice mixture, and a plentiful of solid organic products can be observed by a Fourier Transform Infrared Spectroscopy (FTIR), accompanied with the Quadrupole Mass Spectrometry (QMS) to detect the gaseous photodesorbing species simultaneously. The determination of these organic products shown on the IR spectra is supported by not only the photodesorbing signals of their fragments, but also the thermal desorption signal during Temperature-Programmed Desorption (TPD) process after irradiation. In addition, the photodesorption of these complex organic species can be seen as a significant nonthermal origin in the cold environments.

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