Photodesorption of X-ray Irradiated H_2O:CO:NH_3 Ice Mixtures

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Abstract

The H_2O:CO:NH_3 ice mixtures were irradiated by monochromatic (550 and 900 eV) and broadband X-rays (250–1250 eV) to investigate the photodesorption with different photon fluxes and energies. The photodesorbing signals are detected by a quadrupole mass spectrometer (QMS), with dominant species CO (m/z = 28), H_2 (m/z = 2), and H_2O (m/z = 18). The desorption signals with higher charge to mass ratios for example m/z = 69 (C_3H_3NO or C_4H_5O or C_4H_7N), come from photon-products, and these complex gaseous molecules have been observed in protoplanetary disks. During X-ray bombardment, the desorbing species correspond to the photo-products, which were observed by Fourier transform infrared (FTIR). In this study, we found the photodesorption yields of CO are related to the intensity of OH dangling bond which represents the surface area of pores, and decreasing as the number of absorbed photons increases. The trend of photodesorption yield of CO ice as a function of absorbed photons can be fitted by an equation composed of three exponential terms, which is related to the number of weakly bound species on the surface.

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