

EUV Photolysis of CH₄ + H₂O Mixed Ice Systems at 10 K

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Experimental results on the spectral identification of IR absorption features produced through EUV photolysis of CH₄ + H₂O (100:1), CH₄ + H₂O (1:7) and CH₄ + H₂O (3:7) mixed ice systems at 10 K are obtained. A tunable intense synchrotron radiation light source available at the Synchrotron Radiation Research Center, Hsinchu, Taiwan, was employed to provide the required EUV photons. In this study the photon wavelengths used to irradiate the icy samples were selected to center at the prominent solar lines, namely, 121.6 nm, 58.4 nm, and 30.4 nm. While new molecular species were formed, the original reactants, H₂O and CH₄, were depleted due to their conversion to other species. In the case of CH₄ + H₂O (100:1), we identify IR absorption features of CH₂, CH₃, C₂H₆, C₃H₈, CO and CO₂. In the cases of CH₄ + H₂O (1:7) and CH₄ + H₂O (3:7) mixed ices we find that the major products are CO, CO₂, and H₂CO. Evidently all radicals, e.g., CH₂, CH₃, are fully converted to CO, CO₂, and H₂CO for the case of low CH₄ to H₂O mixing ratios. The detailed results will be presented. This research is based on work supported by the NASA Planetary Atmospheres Program under Grant NAG5-11960.