Photodesorption of ice molecules

Guillermo M. Muñoz Caro*[1], Rafael Martin-Domenech , Gustavo Cruz-Diaz , and Yu-Jung Chen

[1]CENTRO DE ASTROBIOLOGIA (CAB, INTA-CSIC) – Ctra de Ajalvir, km 4 28850 Torrejon de Ardoz (Madrid), Espagne

Résumé

The photodesorption of molecules in ice mantles, induced by vacuum-ultraviolet (VUV) irradiation of interstellar ice analogs in the laboratory, has provided a plausible desorption mechanism in cold regions likde dense cloud interiors, where thermal desorption is not active. Pure CO ice irradiation has been extensively studied because CO ice is not efficiently dissociated at photon energies below 11 eV, and therefore photodesorption is the main effect. In addition, CO ice has a clear infrared absorption band that allows monitoring of the photodesorption. But most molecules present in ice mantles are, either efficiently photodissociated, or not active in the infrared. Compared to CO ice, the experimental study of photodesorption is therefore more challenging, and the detection of the desorbed molecules and their photoproducts can only be made directly in the gas phase. We use transmittance-FTIR spectroscopy of the ice and quadrupole mass spectrometry of the desorbed molecules in the gas phase to provide a quantification of these processes: photodissociation, product formation, and photodesorption of the starting ice molecules and the products. In addition, the VUV-photoabsorption of the molecular ice components is also measured, allowing the determination of their absorption cross sections in the VUV. The final outcome is the estimation of the photodesorption rates as the number of photodesorbed molecules per absorbed photon in the ice. Our recent experimental results will be presented.

*Intervenant