Photo-induced chemistry of ketene under interstellar conditions

L. Krim[1], J.C. Guillemin[2]

[1] Chemistry Department, MONARIS-CNRS/Sorbonne University, France.
[2]Chemistry Department, ISCR-CNRS/University of Rennes, France.

Lahouari.krim@Sorbonne-universite.fr

Ketene (CH_2CO), a molecule of astrophysical and astrobiology interests has been detected in many regions of the interstellar medium. Using a combination of bulk ice and rare-gas matrix isolation studies coupled to FTIR spectroscopy, the present work aims to understand the VUV photochemistry of CH_2CO in solid phase to mimic the photochemistry of organic species trapped in the icy interstellar grains. We show that the photolysis of CH_2CO depends strongly on the environments where it is trapped. The VUV photolysis of CH_2CO/Ne in dilute phase leads to kinetically stable and instable species such as CO, C_2H_2, CH_4, C_2H_4, C_2H_6, H_2CO, CH_3CHO, HCCO, C_2O, C_3O and C_4O. However, the same experiment carried out in the condensed phase shows that the photolysis of CH_2CO ice produces mainly an organic residue which is directly observed at 10 K and remains stable in solid phase at 300 K. The IR spectroscopy analysis suggests that the resulting organic residue could be a polyketone formed at 10K through photo-induced polymerization of ketene. Such organic residues are considered as part of the chemical composition of the interstellar dust grains. They are formed under the extreme conditions of the interstellar medium and play an important role in exobiology.