# VUV PHOTOIONIZATION SPECTROSCOPY OF INTERSTELLAR NITRILES

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Our group has been studying the VUV photoionization of interstellar molecules for a decade, focusing on so-called interstellar complex organic molecules (iCOMs) which usually contain more than 5 atoms. Here we study the photoionization dynamics and the dissociative photoionization, via mass-selected threshold photoelectron spectroscopy (TPES) and velocity map imaging (VMI). To derive photoionization and dissociative photoionization rates for astrophysical applications, ionization and dissociative photoionization cross sections can be estimated to better than an order of magnitude. Here, we used the DELICIOUS 3 spectrometer installed as a permanent end station on the DESIRS beamline at the Synchrotron SOLEIL facility in France, to study a series of interstellar nitriles; all of which have been observed in molecular clouds. These are the following: 1) methyl cyano acetylene (MCA; $C_4H_3N$), 2) Vinyl cyano acetylene (VCA; $C_5H_3N$) and 3) 2-cyano propene (2CP; $C_4H_5N$). MCA has been detected since 1984 by several groups [1], whereas VCA and 2CP have been detected only in 2021[2,3]. Detections are all in the Taurus Molecular Cloud (TMC-1). We will present preliminary results on photoionization mass spectra and slow photoelectron spectra of parent and fragment ions, from the respective ionization energies up to 15.5 eV. This energy range suffices to derive accurate photo rates in cold molecular clouds due to cosmic ray ionization. Calculations are performed too in order to rationalize the chemical structure of the formed fragments. Astrophysical implications of our study will be discussed.

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