

Thermal and photo-induced desorption processes from molecular ices relevant to the interstellar medium

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In the colder regions ($\sim 10 - 100$ K) of space, the matter is predominantly molecular, physisorbed at the surface of micrometer-size dust grains. These icy mantles are the main reservoir of molecules: they can act as catalysts for further chemical complexity, and enrich the gas phase by means of desorption processes. Constraining the desorption is a key parameter in the astrochemical models since it may control dramatically the gas-to-ice abundances ratio. Depending on the temperature of the grains, both thermal and on-thermal desorption processes are at play, and each of these processes needs to be quantified.

I will present experimental approaches that are used to constrain the efficiency of both thermal and photoinduced desorption from model molecular ices. Thermal desorption from cold ice is studied by the TPD method, from which multi-heating rate experiments can provide both adsorption energies and exponential prefactors,^{1,2} the latter being usually arbitrary chosen by empiric formula whose validity can be debated for big and tightly bounded molecules. The UV photodesorption is studied using the tunable UV output of synchrotron facility at SOLEIL, opening up the possibility to extract both absolute efficiencies in the 7 – 14 eV range, and bringing valuable information on the underlying mechanisms of desorption by the identification of the first absorption steps within the ice.³ Some perspective of these works will also be given, in particular concerning the role of higher photon energies (soft X-rays) in the photodesorption from molecular ices.⁴

References

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- [3] e.g. Bertin et al. 2016 ApJ 817, L12 ; Dupuy et al. 2017, A&A 603, A63
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