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# X-ray photodesorption of water ice

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## Abstract

The icy mantle of interstellar dust grains is exposed to a variety of processes, including cosmic ray bombardment, collisions and irradiation, which can eject molecules back into the gas phase and have chemical and structural effects on the ice. Providing experimental constraints on these processes is important for astrophysical modeling. UV photodesorption, for example, has been well studied in the last few years, since UV irradiation is thought to be significant in several interstellar environments [1]. In protoplanetary disks, however, the young star is a source of intense X-ray radiation. X-rays are more penetrating than UV radiations, and therefore the X-ray field is much higher than the UV field in large portions of the disk [2]. The photodesorption induced by this X-ray field may have consequences on the gas-phase abundances of some species, and may also play a role in the position of the " snow line " of some molecules, i.e. the distance from the star at which a given molecule freezes onto the grains, the most important of which is the water snow line. Only a few experimental studies exist on quantified X-ray photodesorption for astrophysically relevant systems so far, e.g. for methanol [3].

Here we report an experimental study of the X-ray photodesorption of water ice around the O 1s edge (500 – 600 eV). Using our upgraded SPICES 2 set-up at the SEXTANTS beamline of the SOLEIL synchrotron, we measured and quantified photodesorption of neutral species, as well as positive and negative ions. Besides the intact H<sub>2</sub>O molecule, a variety of neutral and ionic fragments and products are observed. Photodesorption spectra of the species give us some insights regarding the physical mechanisms behind dissociation and desorption.

## References:

See e.g. Óberg et al., *A&A* 496, 281 (2009a) ; Fayolle et al., *ApJ* 739, L36 (2011) ; Muñoz-Caro et al., *A&A* 589, A19 (2016)

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