Comparison between astronomical and laboratory spectra of ices

G. Strazzulla

Osservatorio Astrofisico, Città Universitaria, I-95125 Catania, Italy. E-mail-gianni@alpha4.ct.astro.it

Abstract

Ice mantles on interstellar grains are, with few exceptions, not formed by direct deposition of molecular species (say H_2O) but from the deposition of atoms, ions, etc., that recombine on grain mantles (e.g. H+O = OH; OH+H = H_2O). In the laboratory ices are formed by deposition from the gas phase onto cold substrata. How correct is a comparison between astronomical and laboratory spectra?

In fact it is not known if the structure, and then the band shapes, of an ice accreted by direct deposition from the vapor phase is the same of the one formed by recombination of atomic fragments.

On the other hand we have overwhelming evidence that there are significant differences between spectra of unirradiated and ion irradiated ices. Not only new species are synthesized but also the peak position and shape of the bands of original species change. During irradiation, molecular species (say H_2O) are broken and then those fragments (e.g. O, H, OH, etc.) that are not sputtered away and do not go to form other species, recombine to reform the original molecules (i.e. H_2O). In my opinion this could imply that when we irradiate not only simulate a process (irradiation by cosmic rays), but also, perhaps more important, we reproduce in a better way the process of the formation of icy mantles on interstellar grains.

If this is the case the changes in the band shapes of irradiated ices could reflect the "reformation process" and be more directly comparable with those of ices on interstellar grains.