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Ion implantation in ices and its relevance to the icy moons of the external planets

G. Strazzulla, G.A. Baratta, D. Fulvio, M. Garozzo, G. Leto, M.E. Palumbo, F. Spinella

1. INAF-Osservatorio Astrofisico di Catania, Italy, (gianni@oact.inaf.it; / Fax+39-095330592)

Solid, atmosphere-less objects in the Solar System are continuously irradiated by energetic ions mostly in the keV-MeV energy range. Being the penetration depth of the incoming ions usually much lower than the thickness of the target, they are stopped into the ice. They deposit energy in the target induce the breaking of molecular bonds. The recombination of fragments produce different molecules. Reactive ions (e.g., H, C, N, O, S) induce all of the effects of any other ion, but in addition have a chance, by implantation in the target, to form new species containing the projectile. An ongoing research program performed at our laboratory has the aim to investigate ion implantation of reactive ions in many relevant ice mixtures. The results obtained so far indicate that some molecular species observed on icy planetary surfaces could not be native of that object but formed by implantation of reactive ions. In particular we present data obtained after:

- C, N and S implantation in water ice
- H implantation in carbon and sulfur dioxide