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Polyynes synthesis evidenced by VUV spectroscopy of hydrocarbon-rich ices irradiated with energetic electrons

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We present some results obtained by measuring VUV photoabsorption spectra in the range 110-340 nm of hydrocarbon-bearing ices and their mixtures with nitrogen. Samples have been irradiated with energetic (1 keV) electrons simulating conditions relevant to the icy bodies of the Solar System and icy mantles on grains in the interstellar or circumstellar medium. Ices in different astrophysical environments are continuously exposed to energetic processing by photons, electrons and ions that contribute, sometimes dominate, to their physico-chemical evolution.

The results of this study indicate that many molecules among which polyynes $H(-C\equiv C-)_nH$, are produced after irradiation of pure CH_4 , C_2H_4 and C_2H_6 ices. Cyanopolyynes are synthesized when mixtures with nitrogen are irradiated. In addition, irradiation causes a spectral reddening (absorbance increases more at the shorter wavelengths than at the higher ones) and the formation of an unvolatile residuum whose spectral colors in the VUV range have been measured.

Results are discussed with a view to their astrophysical relevance with particular emphasis to the icy surfaces of Pluto and other Trans Neptunian Objects.

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