VUV photolysis of Hydrogenated amorphous carbons. Small hydrocarbons production in Photon Dominated Regions.

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Résumé

Carbonaceous molecules occupy a significant position in interstellar chemistry networks. In the gas phase, most of the ionized or neutral molecules detected in the interstellar and circumstellar media contain at least one carbon atom. Carbon chemistry plays thus a dominant role in the understanding of the structure and evolution of the ISM.
One particular zone of interest to observe small carbonaceous radicals and molecules, are the sharp molecular clouds edges exposed to energetic photons. These photon dominated regions (PDRs) (Gerin et al. 2005; Teyssier et al. 2005; Pety et al. 2005) are rich in these hydrocarbons (like CCH, c-C3H2, C4H), and provide tests for the chemistry models in the diffuse to molecular transition.

The pure gas phase models generally fail in reproducing the abundance of many of the observed species, and several authors suggest such abundances may arise from the products of the VUV photodissociation of carbonaceous grains or PAHs (Teyssier et al. 2004; Pety et al. 2005). Hydrogenated amorphous carbons (a-C:H or HAC), abundantly observed in the ISM, could also be at the origin of many of these small hydrocarbons.

In this work, we experimentally investigate the production and release of hydrocarbons from the VUV photolysis of a-C:H interstellar analogues under ultra-high vacuum. The experimental results are applied to a Photon Dominated Region model, to constrain the impact of this release on the observed gas phase species.

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