PHOTODESTRUCTION OF PAHS IN PLANET-FORMING REGIONS. Thiago Monfredini[1], Wania Wolff[2], Heloísa M. Boechat-Roberty[3] [1]LNLS/CNPEM, [2]IF/UFRJ, [3]OV/UFRJ.

Emission bands associated with Polycyclic Aromatic Hydrocarbon (PAH) molecules are observed in the direction of many classes of astrophysical objects, like Active Galactic Nuclei, (e.g. [6], [7]), (proto-) planetary nebulae and dense molecular clouds ([1], [8]). It is thought that astrophysical PAHs are formed in the circumstellar environment of stars at the Asymptotic Giant Branch (AGB), and are spread through the interstellar medium, being one of most important reservoir of organic molecules of the Interstellar Medium (ISM). These PAHs can reach 50 to 150 C atoms in their structure (and also clusters with ~ 400 C atoms) and are detect by their IR emission features ([2], [9]).

PAH emission has also been detected from the circumstellar discs of T-Tauri stars - pre-main sequence stars, with masses similar to the Sun ([3], [5]). As these discs are sites of planetary formation, the PAHs, processed by photons and particles like protons and electrons of the star wind, could be inherited by the forming planets. This process could contribute to their initial carbon content, and having implications for the prebiotic chemistry.

The disks of T-Tauri stars are subjected to intense radiation fields of UV and X-ray photons. X-ray photons are produced both by mass accretion onto the star surface and by shocks of the ejected matter, forming the outflow winds, as observed by [4].

We examined the photochemistry of simple PAHs: naphthalene ($C_{10}H_8$), anthracene ($C_{14}H_{10}$), methyl-anthracene ($C_{15}H_{12}$) and pyrene ($C_{16}H_{10}$) at the photon energies of 275eV, 310eV, 1900eV and 2500eV in order to apply the findings at the T-Tauri scenario. The measurements were performed at the Brazilian Synchrotron Light Laboratory (LNLS) using the time of flight mass spectrometry and the photoelectron-photoion coincidence techniques The absolute single and double photoionization and photodissociation cross sections were determined for each molecule at each energy. Their ionization and destruction induced by X-rays was examined in the conditions of the circumnuclear region of the DG Tau, a T-Tauri star, which presents an X-ray luminosity of $2.4x10^{28}$ erg s^{-1}. It was verified a higher photostability of PAHs without functional groups attached. At higher photon energies, the results suggest a higher production yield of double charged PAHs in comparison to the single charged ones (e.g., 2x higher for double ionized naphthalene at 2500 eV). The production of double charged molecules increased with the size of the molecules .

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