ARCHAEOLOGY OF THE SAGITTARIUS GALAXY BY MEANS OF ITS STELLAR CLUSTERS

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The Sagittarius dwarf spheroidal (Sgr dSph) galaxy is a Milky Way satellite currently merging with the parent system. This small galaxy is undergoing disruption due to tidal forces, while stars and clusters lost along the orbit progressively mix with the general Galactic population. The Sgr system is also one of the very few local dSph's known to host stellar clusters, but the census of its cluster population is far from complete. This is very bad, both because the total amount of clusters can help estimating the mass of the original system, and because the age-metallicity relations of the so-far confirmed six members shows an age gap at intermediate ages similar to the well-known gap of the Large Magellanic Cloud. Still, this feature could be due only to the small number of confirmed members. Here we show the status of our project aimed at testing the membership to the Sgr galaxy of a series of candidates proposed in the literature. Our recent spectroscopic studies could exclude the Sgr membership of three candidates, namely Ruprecht 106, NGC 4147, and E 3, although a follow-up study of the latter is ongoing to confirm the previous results. On the other hand, our chemical analysis concluded that NGC 5634 is very likely a member of the Sgr cluster family, and NGC 5053 also could be. Finally, we present our preliminary results of our spectroscopic analysis for the last object, namely AM 4. This candidate is particularly important, because previous estimates of age and metallicity indicate that it closely follow the relation traced by confirmed clusters, but its intermediate age makes it fall exactly at the middle of the supposed age gap.

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STABILITY OF THE HYDROGENATED BENZENE IN THE PDR OF THE PLANETARY NEBULA NGC 7027

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Polycyclic aromatic hydrocarbons, (PAHs), constituted by benzene (C_6H_6) rings, as well as hydrogenated PAHs (H_n-PAHs), compounds with excess peripheral H atoms, emit infrared bands ($3-12\ \mu$m) due to their vibrational transitions. These molecules are present in different astrophysical environments. For example, the band at 3.3 μm, assigned to vibration of aromatic C-H bonds, is generally accompanied by the band at 3.4 μm, assigned to vibration of aliphatic C-H bonds. The abundances of these molecules in circumstellar environments depend on the rates of formation and destruction by UV and X-rays radiation.

We study experimentally the photoionization and photodissociation of the cyclohexane molecule (C_6H_{12}), a prototype H_n-PAH, using synchrotron radiation at UV (10-100 eV) and soft X-ray (280-310 eV) energies and the time-of-flight mass spectrometry. The measurements were performed at Brazilian National Light Synchrotron (LNLS) using the toroidal grating monochromator (TGM) beamline. From the mass spectra of ionic fragments produced by the interaction of photons with the molecule in gas phase, the production of each ion was quantified as a function of the photon energy. Moreover, the stability of C_6H_{12} and C_6H_6 was analyzed by the identification of the produced ions.

A greater production of ethyl ($C_2H_n^+$) and propyl ($C_4H_n^+$) ion groups was observed from the photodissociation of C_6H_{12}. We determined the photon flux as a function of the energy in the photodissociation region (PDR) of the planetary nebula NGC 7027, taking into account the attenuation caused by the H and the dust grains. From these photon flux values and the photoionization and photodissociation cross-sections, the ionization and destruction rates of C_6H_{12} and C_6H_6 were determined. We concluded that the aromatic structure is more stable than the aliphatic structure against UV and X-ray radiation emitted by central star.

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