New results about the survival of PAHs in interstellar shocks

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There is an increasing observational evidence that a non-negligible fraction of cosmic carbon is locked into macromolecules like Polycyclic Aromatic Hydrocarbons (PAHs). These species have been proposed as possible carriers of the dominant astronomical emission features in the mid-infrared and they play an active role in the cosmic matter cycle.

In the interstellar medium, PAHs are processed by energetic ions and electrons accelerated in supernova shocks. It is therefore important to quantify the capability of PAHs to survive under these very common conditions and to determine the structural modifications induced by such energetic processing. The first study on this topic [1] has shown that PAHs are surprisingly fragile when facing ions and electrons bombardment under interstellar conditions. One of the key quantities to consider in these processes is the threshold energy T_0, defined as the minimum energy that must be transferred to a single carbon atom in the PAH via a binary collision, in order to eject that same atom from the molecule. Back then, the value of T_0 for PAHs was not well-constrained and therefore making reasonable assumptions was the only option. The situation is now different thanks to recent experimental and theoretical findings [2].

I will present a re-evaluation of the lifetime of PAHs in interstellar shocks [3], based on the newly determined values of T_0. This will provide the occasion to emphasise which are the main destruction processes for interstellar PAHs, what are the relevant conditions, and which are the gaps in our understanding of these basic destruction processes that should be filled.

This research also exemplifies the mutual gain resulting from the synergy between theorists, experimentalists and observers. Astrophysical results have stimulated the physics community to pursue experimental and theoretical studies, which have provided the measurements necessary for the better determination of the survival rate of interstellar PAHs presented here.

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References

[1] E. R. Micelotta, A. P. Jones and A. G. G. M. Tielens, *A&A*, 2010, 510, A36.
[2] M. H. Stockett, M. Gatchell, T. Chen, et al., *J. Phys. Chem. Lett.*, 2015, 6, 22, pp. 4504-4509.
[3] E. R. Micelotta, *in preparation*.