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PAH photodissociation and the formation of H₂

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Polycyclic Aromatic Hydrocarbon (PAH) molecules are ubiquitous carbonaceous molecules, responsible for the Aromatic Infrared Bands (AIB) dominating the IR spectrum of diverse astronomical environments, from planetary and reflection nebulae, to transitional disks to entire galaxies (Tielens, 2013). PAHs make up the low-mass end of the grain size distribution (Weingartner & Draine 2001) and, akin to dust grains, these molecules can act as catalytic surfaces where H₂, the most abundant molecule in the Universe (Draine & Bertoldi, 1996), can efficiently form. The invoked mechanism is addition of a H atom and subsequent abstraction of a H₂ unit by an incident H atom (Wakelam et al, 2017). Other mechanisms, like photodissociation, were considered so far less important.

Recently we studied the photodissociation of a sample of PAH cations of astronomical size with a combination of experiments, quantum chemistry and modeling (Castellanos et al, 2018a, 2018b). We found that PAHs behave differently depending on their size and shape, and that H₂ can be a likely product of the dissociation. In this talk I will show these results and discuss how they impact our understanding of H₂ formation on PAHs in photodissociation regions.

References:

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Yes

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