

Probing the Dissociation of Interstellar Polyaromatics

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The presence of interstellar polycyclic aromatic hydrocarbons (PAHs) is inferred from the mid-infrared (mid-IR) emission bands that are observed at 3.3, 6.2, 7.7, 8.6 and 11.2 μm . This IR radiation is emitted as the PAHs cascade down to the ground state after they have been excited by interstellar (vacuum) ultraviolet radiation. [1] PAHs have been observed towards a large number of galactic and extragalactic sources and it has been derived that PAHs constitute up to 15% of the total cosmic carbon budget, emphasizing their importance in the cosmic cycle of matter.

Energetic processing of interstellar polyaromatics may result in ionization and/or dissociation. It has been hypothesized that this chemical evolution is reflected in changes in the observed mid-IR emission bands. Observational and laboratory data suggest that dissociation of large interstellar polyaromatics eventually results in fullerene formation. The underlying processes involved in the dissociation of aromatics are not yet understood.

Our group characterizes the dissociation of polyaromatics by means of lab-based measurements as well as measurements at large-scale facilities. By combining these techniques with quantum chemical computations we obtain insight in the dissociation at a molecular level of detail. [2, 3] I will review some of our recent results and will emphasize their importance in light of astronomical observations.

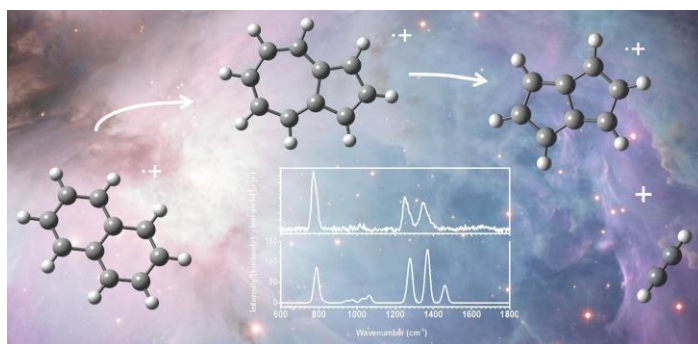


Figure 1: Spectroscopic evidence for the formation of pentagonal structures from the dissociative ionization of naphthalene. Figure taken from Bouwman et al. 2016.

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References

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