

# SEARCH FOR THE 4430 Å DIB IN THE SPECTRUM OF CORONENE

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**ABSTRACT.** Polycyclic Aromatic Hydrocarbon (PAH) molecules have been proposed as candidates to explain the Diffuse Interstellar Bands (DIBs). We have performed laboratory measurements of coronene, using rare gas matrix isolation techniques and UV photolysis. Our aim was to search for a possible identification of the 4430 Å DIB, but also to provide data almost free from environmental band shifts and broadening, which can be used for astronomical identification of the species.

## 1. Introduction

In 1985, independently, van der Zwet & Allamandola, and Léger and d'Hendecourt have proposed that Polycyclic Aromatic Hydrocarbons (PAHs) could be attractive candidates of the Diffuse Interstellar Bands (DIBs), seen in many galactic and extragalactic objects. The main arguments in favour of PAHs are their stability against photodissociation and their high abundance (Léger and d'Hendecourt, 1985). Furthermore, large neutral PAHs and PAH<sup>+</sup> ions have strong electronic transitions in the visual (Crawford et al., 1985) and the expected rotational structures of these transitions are narrow enough to be compatible with the observed widths of DIBs (van der Zwet & Allamandola, 1985).

In the ISM a selection mechanism can originate from the physical conditions that favors a few species, whose absorptions give rise to the DIBs.

The visible spectrum of the coronene cation, as measured in different solvents, shows the presence of a strong band at a wavelength close to the 4430 Å DIB (Shida & Iwata, 1973, Khan, 1988). It is therefore quite attractive to measure the intrinsic spectrum for this species. We present the visible spectra of partially ionized coronene, isolated in a neon matrix and compare the spectrum with those in different solvents, to determine the perturbation they introduce.

## 2. Results

In Fig. 1 the spectrum of partially ionized coronene, isolated in neon matrix is compared with ionized coronene in solid boric acid, obtained by Khan, 1988. In our experiment we used photoionization by irradiation with UV light from a H<sub>2</sub> (0.1 - 1 mbar) microwave excited discharge lamp. Comparing the spectra in both environments shows, as expected, that the interaction in boric acid produces important broadening and red shifts of the bands with respect to that in neon matrices. For the 9465 Å band vibrational replica can be seen at shorter wavelengths in neon.

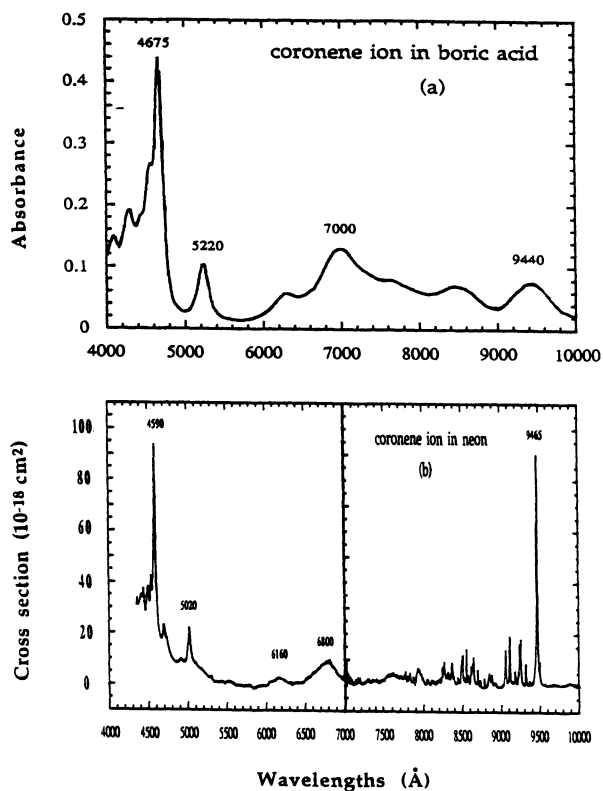


Figure 1. (a) Electronic absorption spectrum of the coronene cation, obtained in solid boric acid (adapted by Khan, 1988) (b) Coronene in a neon matrix

### 3. Discussion

The coronene cation was a potential candidate for the carrier of the 4430 Å DIB and has been measured in a neon matrix. The 4590 Å band does not coincide with the observed DIB at 4430 Å, rejecting coronene as a possible carrier. Conversely, the reported data on the spectrum of the coronene cation can be used to search for the presence of this species in the interstellar medium. Finally, the measurement of band shifts for large PAHs, caused by organic and polar matrices can be useful to estimate the intrinsic band position for similar molecules from the knowledge of their spectra in solvents.

#### References

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