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Short Communication

Excimer emission from anthracene and methyl colanthin

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Since Forster and Kasper [1] discovered excimer emission from a strong solution of pyrene, various workers have reported excimer emission from solutions of other aromatic hydrocarbons [2]. Until now no excimer emission has been reported from anthracene solution, although 9-methyl anthracene does show such emission in solution. Except in the case of pyrene, the monomer and excimer emission strongly overlap and in most cases the peak of the excimer band has been located by the difference method proposed by Briks and Christophorou [3]. Briks *et al.* [5] have further shown that the monomer and excimer emission peaks are separated by about 6000 cm^{-1}. This locates the excimer emission peak at about 470 nm for anthracene. The monomer emission from anthracene shows sharp vibrational progression (Fig. 1) and extends up to about 500 nm. A vibrational peak is located near 450 nm. It may be possible that the excimer band is hidden near the tail of monomer emission band.
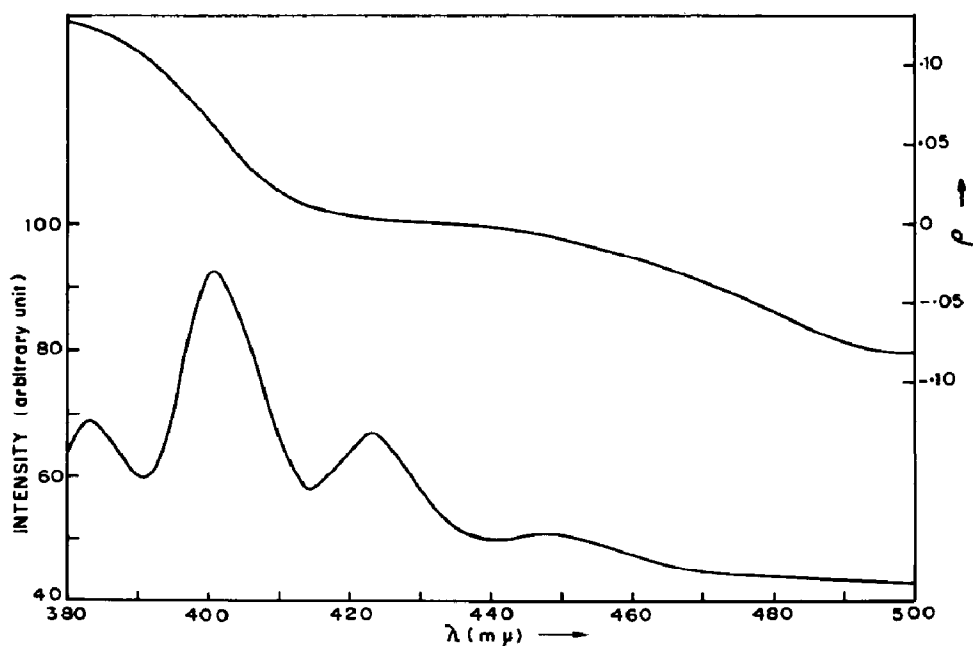

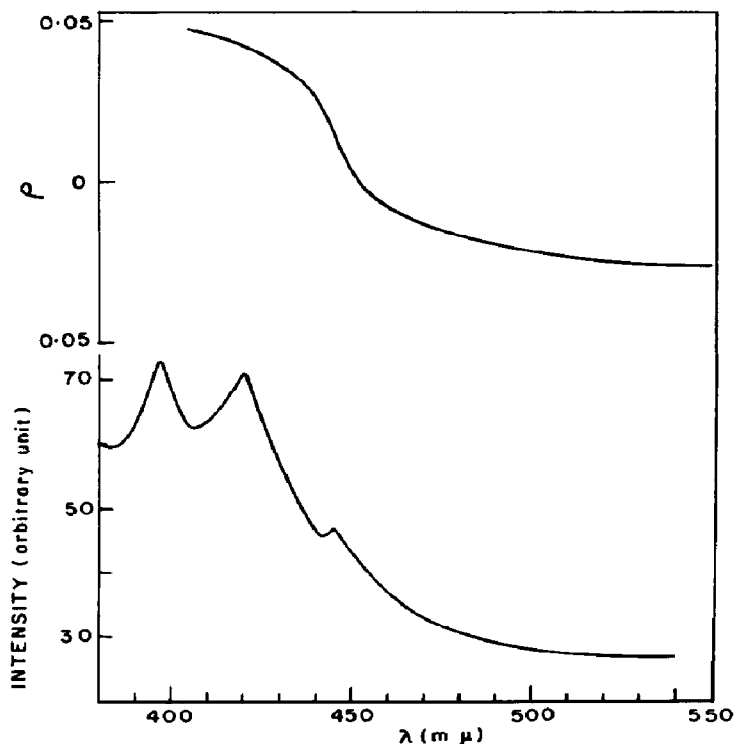Fig. 1. Emission and depolarization spectra of anthracene.

Fig. 2. Emission and depolarization spectra of methyl colanthin.

It has recently been shown [4] that the depolarization factor of mono-mer and excimer emission from pyrene in polystyrene gel has the opposite sign from that expected from the sandwich structure of excimer. This fact may be used to locate an excimer band. The depolarization ratio (ρ) of 10^{-3} M anthracene in 22.5% polystyrene gel in benzene showed that ρ was posi-tive below 450 nm, and negative above 450 nm. We may therefore locate the excimer emission band above 450 nm, preferably near 480 nm.

The emission spectra of methyl colanthin (10^{-5} M) in benzene is given in Fig. 2. In strong solution (10^{-3} M) there is a slight hump above 470 nm, which may be associated with excimer band. The depolarization measure-ments show (Fig. 2) that ρ is positive below 450 nm but negative above 470 nm. So we may safely associate the band above 450 nm with excimer band.

In these cases, however, neither the positive nor the negative ρ value attained the theoretical value demanded by Perrin–Joblonski theory. In 10^{-3} M solutions used in these measurements the concentration quenching effect is significant. So even the monomer emission will be somewhat depolarized. It is, however, hard to believe that concentration quenching can make de-polarization factor negative.

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3 J. B. Briks and L. G. Christophorou, Nature, 196 (1962) 33.
4 A. S. Ghosh and S. Basu, J. Photochem., 3 (1974) 247.
5 J. B. Birks, M. D. Lumb and I. H. Munro, Proc. Roy. Soc. (A), 280 (1964) 289.