Photocyclization of Benzanilides to Phenanthridones with Elimination of the *ortho*-Methoxy-group

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Summary Benzanilides with an *ortho*-methoxy-group on the benzoyl ring undergo efficient nonoxidative photocyclization to give phenanthridones by elimination of methanol.

ALTHOUGH the oxidative photocyclization of *cis*-stilbenes to phenanthrenes has been studied extensively,[1] only limited information is available on the related reactions of anilides.[2a,b] We have recently reported that certain heterocyclic anilides are readily photo-cyclized to condensed quinolones.[2b] During a study of the photoreactions of amides and imides,[2c] we examined the effect of irradiation on the *ortho*-methoxy-substituted benzanilide (**1a**).† The expected phenanthridone (**2**; $R^1 = R^2 = R^3 = H$; $R^4 = OMe$) was not detected

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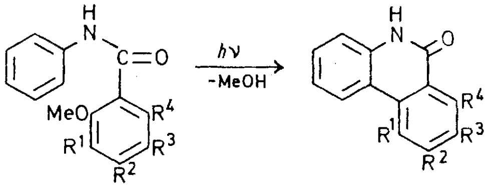
† Irradiation was performed in benzene EtOH (9:1) with a 100 W high-pressure mercury lamp for 6 h. All new compounds gave satisfactory analytical results and had spectral properties (u.v., i.r., n.m.r., mass) consistent with the structures assigned.

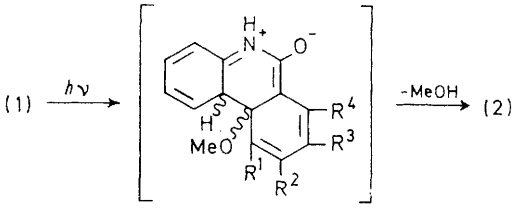
and instead, the unsubstituted parent phenanthridone (**2a**) was isolated in 8% yield. Likewise, (**1b**—**f**) afforded the phenanthridones (**2b**—**f**), respectively, in fair yield. None of the 'normally' cyclized products retaining the initial *ortho*-methoxy-group were detected.



(1) (2)

		Yield (%)
a;	$R^1 = R^2 = R^3 = R^4 = H$	8
b;	$R^1 = OMe; R^2 = R^3 = R^4 = H$	80
c;	$R^1 = R^3 = R^4 = H; R^2 = OMe$	50
d;	$R^1 = R^2 = R^4 = H; R^3 = OMe$	37
e;	$R^1 = R^2 = R^3 = H; R^4 = OMe$	45
f;	$R^1 = R^4 = H; R^2 = R^3 = OMe$	64

In the photocyclization of stilbene analogues, several examples of the elimination of the *ortho*-group such as methyl and halogen have been reported.[3] However, irradiation of *o*-methoxystilbene gave only traces of phenanthrene, which could not be isolated in quantity even in a preparative experiment.[3b] This photocyclization of (**1**) to (**2**) with expulsion of the *ortho*-methoxy-group thus may be characteristic of the anilide system.



(3)

Since degassed solutions of (**1b**) smoothly gave (**2b**) and the formation of methanol during the reaction was confirmed by identification as its *p*-nitrobenzoate, the reaction may proceed by a nonoxidative mechanism in which the intermediate dihydrophenanthrene analogue (**3**) undergoes thermal elimination of methanol to give (**2**).

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[3] (a) E. V. Blackburn, C. E. Loader, and C. J. Timmons, *J. Chem. Soc.* (*C*), 1970, **163**, and papers cited therein; (b) C. S. Wood and F. B. Mallory, *J. Org. Chem.*, 1964, **29**, 3373.