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NOTE

Studies in the Effect of Intensity and Solvent on the Course of Photolysis of 5,5-diphenylhydantoin

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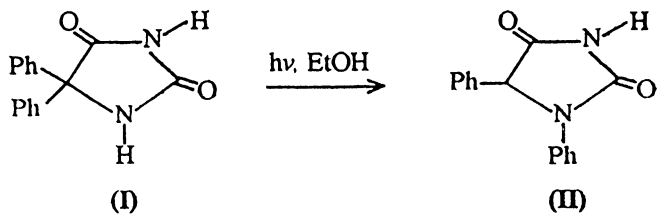
5,5-diphenylhydantoin (**I**) when irradiated by low and high intensity UV source in ethanol gave product (**II**) and in acetic acid gave urea (**III**) and benzophenone (**IV**), in different yields and in different time. The structure of product (**II**) has been established by spectral and elemental analysis whereas products (**III**) and (**IV**) have been identified by mixed melting point and co-TLC with authentic samples.

Key Words: Effect of intensity, Solvent, Photolysis, 5,5-Diphenyl hydantoin.

Photochemistry of organic compounds has been a vast field of research since a long time. The effects of various parameters like wavelength, intensity, nature of solvent, pH, etc. have also been studied[1-4]. However, there is a single report on the photolysis of hydantoin[5]. Therefore, the photolysis of 5,5-diphenylhydantoin using low intensity and high intensity UV source in ethanol and acetic acid has been reported.

Photochemical reaction of 5,5-diphenylhydantoin in ethanol under low intensity UV source: 5,5-diphenylhydantoin[6] (2 g) was dissolved in dried and distilled ethanol (200 mL). To this solution benzophenone was added as sensitizer and the solution was irradiated by low intensity UV lamp in an immersion well photoreactor. The progress of the reaction was monitored by TLC. The reaction completed in 26 h. Then the irradiation was stopped. The reaction mixture was concentrated on a water bath under reduced pressure and then was left overnight, when a colourless product (**II**) separated out. It was filtered and recrystallized from ethanol.



(I) (II)

Scheme-1

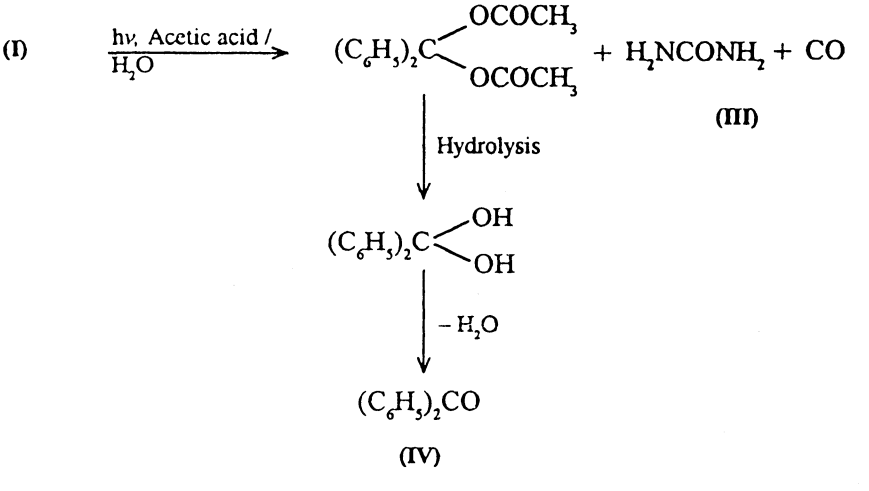
Reaction under high intensity UV source: The reaction was carried out in the same manner as above using high intensity UV source in place of low intensity

UV source. The reaction completed in 20 h. Then the reaction mixture was concentrated and the product was separated out; it was filtered and recrystallized from ethanol. The product was found to be same as (**II**) by co-TLC and mixed melting point.

Photochemical reaction of 5,5-diphenylhydantoin in acetic acid under low intensity and high intensity UV source: The reaction was carried out in the same manner as above using acetic acid, water as solvent in place of ethanol. Same products, *viz.*, urea (**III**) and benzophenone (**IV**) were obtained under both the conditions however, under low intensity UV source the reaction completed in 40 h, whereas under high intensity the reaction completed in 30 h. The reaction mixture was concentrated by distillation on a water bath under reduced pressure. The products were separated by fractional crystallization and were recrystallized from ethanol.

Irradiation of 5,5-diphenylhydantoin (**I**) under low and high intensity UV source in ethanol gave 1,5-diphenylhydantoin (**II**) (**Scheme-1**) by photorearrangement. IR (KBr, cm^{-1}) 3232 ν(N—H stretch), 1708 ν(C=O str. lactam ring), 1446, 1602 ν(C=C arom. ring str.). ^1H NMR ($CDCl_3$): δ 8.2 (NH protons), δ 7.3–7.4 (aromatic protons) and δ 3.0 (CH protons). ^{13}C NMR: δ 118–120 (Ar—H carbon atoms), δ 197.3 (carbonyl carbon), δ 68 (carbon in five-membered ring). The mass spectrum gave molecular ion peak at m/z 252. Other peaks were observed at m/z 223, 180 (base peak), 147, 104.

5,5-diphenylhydantoin (**I**) when irradiated by low intensity and high intensity UV source in acetic acid gave urea (**III**), benzophenone (**IV**) and carbon dioxide (**Scheme-II**). The identity of (**III**) and (**IV**) has been established by mixed melting points and co-TLC with the authentic samples.



Scheme-2

5,5-diphenyl hydantoin (**I**) is found to be photochemically reactive by low and high intensity UV source in solvents, *viz.*, ethanol and acetic acid. At high intensity the time of irradiation is less and the yield of the products is more as compared to low intensity. This indicates that the rate of the reaction is affected by the intensity of the source, with high intensity source the reaction is faster. The solvent affects the course of the reaction, giving different products in ethanol and acetic acid.

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