

FORMATION OF FUNCTIONAL MOLECULES  
VIA PHOTOADDITIONS OF QUINONES

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The photochemical reactions of some quinones were studied in organic solvents using UV light. Four types of compounds, such as olefins or alkynes, 1,3-diketones, titanium dioxide and anilines, were selected to investigate the photochemistry of quinones. The quinones were irradiated in the presence of olefins or alkynes in organic solvents to give various photoadducts, including spiro-compounds and quinomethanes. Irradiation of a solution of 1,2-benzoquinones and 1,4-diphenyl-1,3-butadiene in dichloromethane afforded phenanthrenes *via* a series of pathways, *i.e.*, [4+2] addition, decarbonylation, oxidation, isomerization, cyclization and oxidation. An enyne was also irradiated with *o*-quinones to give the isomeric phenanthrenes. In the case of the photoreaction of duroquinone with 1,4-diethynylbenzene, the final product was found to be 1:2 adduct which could be converted into a cage molecule when irradiated in the presence of copper(I) chloride. It was observed that a cyclobutane can be produced when irradiated some *o*-quinones and 1,4-diethynylbenzene in dichloromethane. The quinones also added to 1,3-diketones to give 1,5-diketones *via* photoaddition followed by retro-aldol type cleavage. It was also found that titanium dioxide can catalyze the photoreactions of quinones in methanol to give two different hydroxymethylated quinones. Finally, the photoreactions of the quinones were studied in liquid amines, including *N,N*-dimethylaniline and *N*-methylaniline, in which the major products were found to be aminoquinones as 1:1 and 1:2 adducts, respectively. Some haloquinones were also selected to compare the photochemical reactivities in amines.

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