

MECHANISTIC STUDIES OF PHOTOINITIATORS FOR POLYMERIZATION

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The majority of photoinitiators for free radical polymerization are based on ketone photochemistry. We show that quinizarin derivatives are efficient visible-light sensitive photoinitiators in combination with an appropriate electron donor (tertiary amines), an electron acceptor (iodonium salt), or H donor (thiol derivative) for free-radical polymerization, cationic polymerization, and thiol-ene process, respectively. The mechanisms and kinetics of the reactive intermediates involved were investigated in detail by time-resolved spectroscopies. A structurally similar anthraquinone sulfonic acid was efficient as photoinitiator to generate antibacterial hydrogels in an aqueous system.

Oxygen quenching of triplet states of photoinitiators is a major concern, which reduces the initiation efficiency in the presence of atmospheric oxygen. With very few exceptions, the quenching rate constants of triplet states of organic molecules range between 2 to 6 x 10⁹ M⁻¹s⁻¹. Here we show that a series of modified thioxanthone derivative photoinitiators can have more than one order of magnitude lower rate constants for oxygen quenching of their triplet states (as low as 0.1 x 10⁹ M⁻¹s⁻¹).