

# Time-Resolved Spectroscopy Studies of Selected Photoredox Reactions

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## Abstract

Unusual and efficient self-photoredox reactions were reported for some benzophenone (BPs) and anthraquinone derivatives (AQs) in aqueous solutions in which the carbonyl undergoes reduction to its alcohol and a side chain alcohol group undergoes oxidation to its carbonyl.[1-4] To better understand the photoredox reaction mechanisms of these types of BPs and AQs in aqueous solutions, we have used several time-resolved spectroscopy methods such as femtosecond transient absorption (fs-TA), nanosecond transient absorption (ns-TA) and nanosecond time-resolved resonance Raman (ns-TR<sup>3</sup>) to directly observe and characterize the intermediates and transient species after they are produced in the photoredox reactions of interest.[5-8] In this talk, we summarize our results of the time-resolved spectroscopic observations to learn more about the water-assisted photoredox reactions of selected BPs and AQs that we investigated. The photoredox reactions studied for the BPs and AQs under acidic aqueous conditions are initiated by a proton transfer, while AQs can also react via a proton coupled electron transfer (PCET) leading to the photoredox reaction in neutral aqueous solutions.[5-8] A better understanding of the photophysical routes and the photochemical reactions in aqueous solutions of typical examples of these new self-photoredox reactions for aromatic carbonyl compounds not only reveal new fundamental information to better elucidate the photochemistry of carbonyl containing compounds but can also help in the development of the applications of these systems in both photochemical and photobiological fields.[5-8] Additionally, the importance of the water molecules in the photochemical reactions of interest here can also spur further understanding of how water induces the photochemistry of related carbonyl containing compounds in aqueous solutions.

**Keywords:** Photoredox, time-resolved spectroscopy, intermediates, reaction mechanisms

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