

HYDROGEN ATOM TRANSFER AND ELECTRON TRANSFER REACTIONS VIA TRIPLET EXCIPLEXES

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Hydrogen atom transfer, proton transfer and electron transfer reactions in the excited state are elementary processes in chemistry and biochemistry. A large number of studies on these reactions have been reported. In the past two decades, we have had considerable interest in photophysical and photochemical properties of aromatic compounds in the presence of protons.

Upon direct excitation of naphthalene derivatives, proton transfer reaction together with proton-induced quenching occurs effectively from the excited singlet state. In contrast, it is found by means of 355 nm laser photolysis that new photochemical reactions of triplet naphthalene derivatives ($^3\text{NpX}^*$) produced by triplet sensitization of benzophenone (BP) take place: hydrogen atom transfer (HT), proton-induced (PIET) and hydrogen-bonding induced electron transfer (HBIET) reactions occur efficiently via triplet exciplexes between $^3\text{NpX}^*$ and BP. In the nanosecond time-scale, the triplet energy transfer from $^3\text{BP}^*$ to NpX occurs in polar media and in the microsecond time-scale photochemical reactions such as HT, PIET and HBIET originate from the triplet exciplexes. The triplet exciplexes are revealed to have loose-sandwich-like structures with weak charge-transfer character.