Photoinduced Electron and Proton Transfer with Metal Complexes and Organic Molecules

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Proton-coupled electron transfer (PCET) plays a key role in the activation of small inert molecules such as H\textsubscript{2}O, CO\textsubscript{2}, or N\textsubscript{2}. In this greater context it seems important to understand PCET reactions on a fundamental level. Over the past few years our group has performed a series of mechanistic studies of photoinduced PCET. [1] In a typical reaction, a photoexcited Ru(2,2'-bipyrazine)\textsubscript{3}\textsuperscript{2+} complex was used to trigger coupled electron (ET) and proton transfer (PT) from phenols (or thiophenols) to the ruthenium complex (Figure 1, left). [2,3]

In other studies we have explored photoinduced long-range electron transfer reactions which are coupled to short-range proton transfers (Figure 1, right). [4] Even electron tunneling events occurring over distances of 20 Å can take place in concert with proton transfer. [5] The influence of electron donor – electron acceptor distance on long-range PCET was explored systematically. [6]

The last part of the presentation will focus on our recent studies of electron transfer in donor-bridge-acceptor molecules and organic mixed valence compounds. [7,8]

Recent references: