Photoactivatable Derivatives for Chemical and Biological Applications – Design, Synthesis and Mechanistic Investigations

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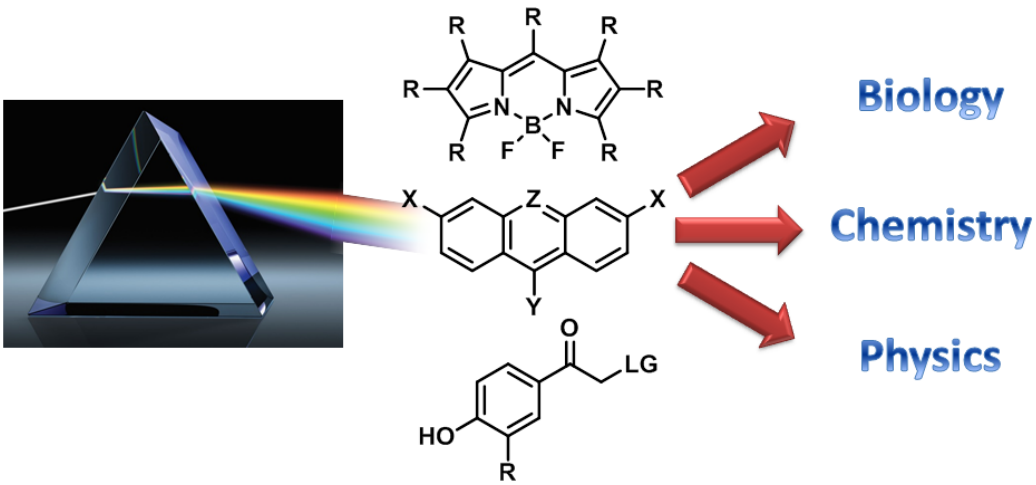
The presentation will be divided into three parts.
The first part deals with design, synthesis and mechanistic investigations of photoremovable protecting groups (PPGs)[1], which are suitable for specific visible light assisted release of substrates (e. g. drugs, hormones, inhibitors) in tissue with a high temporal and spatial resolution. The key properties of photoremovable protecting groups are summarized and current limitations and issues of PPGs are introduced. The progress in this field developed by us will be discussed. New chromophores based on xanthene and BODIPY structural motif are capable of cargo release by visible to NIR light. The release of fluoride as a poor nucleofuge will be introduced. Finally, a new strategy of photochemical biorthogonal "catch and release" strategy will be shown.
The second part of the presentation will focus on molecules capable of *in vivo* releasing carbon monoxide upon absorption of visible light (photoCORM). Biogenic carbon monoxide has in physiological concentrations anti-inflammatory and anti-proliferative effects[2] and acts as an important signaling molecule.[3]
The third part summarizes mechanistic studies on photoinduced electron transfer and heavy atom effect. The mechanism of several photocatalytic systems was elucidated by means of steady-state and transient absorption and emission spectroscopy. The mechanistic studies were accomplished with sophisticated physico-chemical methods out of which some were especially developed for studying of photocatalytic mechanisms.
The thesis was published in 5 impacted journals[4-8], 2 were submitted and 3 further publications are currently in preparation.



(1) Pelliccioli, A. P.; Wirz, J. *Photoch. Photobio. Sci.* **2002**, *1*, 441.
(2) Motterlini, R.; Otterbein, L. E. *Nat. Rev. Drug Discov.* **2010**, *9*, 728.
(3) Kim, H. P.; Ryter, S. W.; Choi, A. M. K. *Annu. Rev. Pharmacool. Toxicol.* **2006**, *46*, 411.
(4) Antony, L. A. P.; Slanina, T.; Šebej, P.; Šolomek, T.; Klán, P. *Org. Lett.* **2013**, *15*, 4552.
(5) Šebej, P.; Wintner, J.; Müller, P.; Slanina, T.; Al Anshori, J.; Antony, L. A. P.; Klán, P.; Wirz, J. *J. Org. Chem.* **2013**, *78*, 1833.
(6) Ghosh, T.; Slanina, T.; König, B. *Chem. Sci.* **2015**, *6*, 2027.
(7) Hering, T.; Slanina, T.; Hancock, A.; Wille, U.; König, B. *Chem. Commun.* **2015**, *51*, 6568.
(8) Slanina T.; Šebej P.; Heckel A.; Givens R. S.; Klán P. *Org. Lett.* **2015**, in print, doi: 10.1021/acs.orglett.5b02374