Renaissance of Cyanines: From Synthesis to NIR Photouncaging

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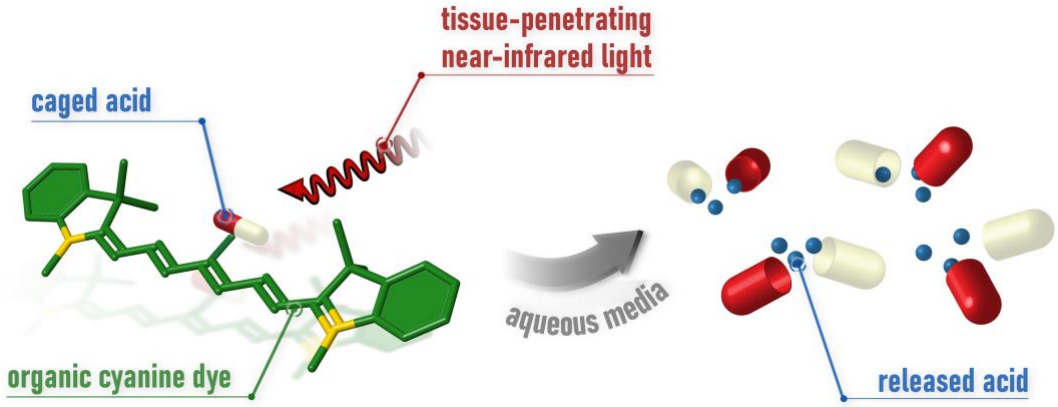
Cyanine dyes represent an indispensable class of chromophores in modern chemistry and biology. Especially heptamethine cyanines (Cy7) are appreciated for their absorption and emission in the tissue-penetrating near-infrared region (NIR; 650–850 nm). Herein, I will showcase that the development of a synthetic methodology for introduction of various substituents along the central cyanine chain enabled tailoring their photochemical and photophysical properties within three orders of magnitude.[1,2] Exercising this control over the structure–property relationship by a single substituent was subsequently harnessed in a number of distinct applications in various fields, including fluorescent probes, biosensors or dye-sensitized upconversion nanoparticles. Finally, I will demonstrate how our strategy fuelled the birth of a new class of cyanine-based photocages that are easily accessible on a multigram scale and efficiently release organic molecule cargo in live human cells upon irradiation with NIR light up to 820 nm with future therapeutic applications in mind.[3]



[1] L. Štacková, P. Štacko, P. Klán *J. Am. Chem. Soc.* **2019**, 141, 7155–7162.
[2] L. Štacková, E. Muchová, M. Russo, P. Slavíček, P. Štacko, P. Klán *J. Org. Chem.* **2020**, 85, 9776–9790.
[3] H. Janeková, M. Russo, U. Ziegler, P. Štacko *ChemRxiv*, **2022**, DOI: 10.26434/chemrxiv-2022-g16fd