

WAVELENGTH GATED PHOTOCHEMISTRY FOR SOFT MATTER MATERIALS DESIGN: THE POWER OF ACTION PLOTS

Christopher Barner-Kowollik

School of Chemistry and Physics, Centre for Materials Science, Queensland University
of Technology (QUT), 2 George Street, 4000 Brisbane Australia
christopher.barnerkowollik@qut.edu.au

The tuning of both covalent bond formation as well as dissociation remains a grand challenge in the design of photodynamic systems. Initially, the lecture will dive into the photophysics of a range of reaction systems devised in our laboratories, exploring how their chemical response varies as a function of varying monochromatic wavelengths. Surprisingly, the absorption spectrum is a poor indicator for photochemical reactivity, as will be demonstrated by a range of action plots on different reaction systems [1-4].

Based on the in-depth insights of our action plot analyses, we will explore how the light-responsive adaptation of polymer materials requires specific wavelengths to induce reversible covalent bond formation and dissociation. Our efforts have been devoted to pioneering a toolbox of photocycloadditions that can be triggered by lower energy visible light, while their cycloreversion functions at the least energetic wavelength, too. The lecture will showcase the latest applications of reversible photochemistry for the generation of light adaptive nano- and micro-structured materials, including examples of out-of-equilibrium photo-dynamic soft matter materials. Examples of irreversible photochemical system for wavelength orthogonal materials designed will be additionally highlighted [5-6].

-
- [1] Feist, F.; Menzel, J. P.; Weil, T.; Blinco, J. P.; Barner-Kowollik, C. *J. Am. Chem. Soc.* 2018, 140, 11848-11854.
- [2] Frisch, H.; Marschner, D.; Goldmann, A. S.; Barner-Kowollik, C. *Angew. Chem. Int. Ed.* 2018, 57, 2036-2045.
- [3] Menzel, J. P.; Feist, F.; Tuten, B.; Weil, T.; Blinco, J. P.; Barner-Kowollik, C. *Angew. Chem. Int. Ed.* 2019, 58, 7470-7474.
- [4] Kalayci, K.; Frisch, H.; Truong, V. X.; Barner-Kowollik, C. *Nat. Comm.* 2020, 11, 1493.
- [5] Houck, H. A.; Blasco, E.; Du Prez, F. E.; Barner-Kowollik, C. *J. Am. Chem. Soc.* 2019, 141, 12329-12337.
- [6] Kodura, D.; Houck, H. A.; Bloesser, F. R.; Goldmann, A. S.; Du Prez, F. E.; Frisch, H.; Barner-Kowollik, C. *Chem. Sci.* 2021, 12, 1302-1310.