

Ortsverband Freiberg
Die Vorsitzende / Prof. Dr. Carla Vogt
Tel. (03731) 39 3468

GDCh-Kolloquium am 15.4.2026

TU Bergakademie Freiberg, Lessingstraße 45

16:15 Uhr, Lessingstr. 45, LES-1001



Prof. Ch. Barner-Kowollik
KIT, Institut für Funktionelle Grenzflächen

Wavelength-Resolved Photochemical Reactivity

When selecting a light source for photochemical processes such as photopolymerizations, photon absorption by a chromophore at a given wavelength is often used to predict reaction efficiency. However, in 2017, we have discovered a strong mismatch between absorption spectra and wavelength-dependent reactivity for many photochemical processes. Herein we investigate the origin of this mismatch in photocycloadditions and photopolymerizations. We propose a theory linking photophysics and photochemistry: Selective excitation of specific microenvironments can trigger molecular transitions that favour wavelength-dependent reactivity, leading to the molecular ensemble to depart from Kasha's rule. Time-resolved and steady-state fluorescence spectroscopy reveal strong red-edge effects, confirming the selectivity. By synthetically tethering chromophores, we further demonstrate the role of microenvironments and wavelength-dependent excited-state lifetimes. This mechanism explains mismatches observed in many photochemical systems and suggests that tuning the chromophore environment can control wavelength-dependent reactivity in applications from additive manufacturing to photodynamic therapy.

Walden, S. L.; Carroll, J. A.; Unterreiner, A.-N.; Barner-Kowollik, C. *Adv. Sci.* 2024, 11, 2306014.

Irshadeen, I.M.; Walden, S.L.; Wegener, M.; Truong, V.X.; Frisch, H.; Blinco, J.P.; Barner-Kowollik, C. *J. Am. Chem. Soc.* 2021, 143, 21113-21126.

Carroll, J. A.; Pashley-Johnson, F.; Klein, M.; Stephan, T.; Pandey, A. K.; Walter, M.; Unterreiner, A. N.; Barner-Kowollik, C. *J. Am. Chem. Soc.* 2025, 147, 26643-26651.

Pashley-Johnson, F.; Wu, X.; Carroll, J. A.; Walden, S. L.; Frisch, H.; Unterreiner, A. N.; Du Prez, F. E.; Wagenknecht, H. A.; De Alaniz, J. R.; Feringa, B. L.; Heckel, A.; Barner-Kowollik, C. *Angew. Chem. Int. Ed.* 2025, 64, e202502651.

Interessenten sind herzlich willkommen!

Prof. Dr. C. Vogt
Ortsverbandsvorsitzende



GESELLSCHAFT DEUTSCHER CHEMIKER

Prof. Dr. G. Frisch
Fakultätsdekan