Investigation into the Dynamic Properties of Photoswitching Azocages using Advanced Spectroscopic Techniques

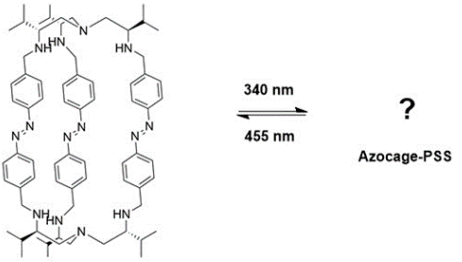
S. K. Chisholm[1], C. Müller[2] , R. J. Kutta[1], C. Merten[2] , P. Nuernberger[1]

[1]Faculty of Chemistry and Pharmacy, University of Regensburg, Regensburg, Germany
[2]Faculty of Chemistry and Biochemistry, Ruhr-University Bochum, Bochum, Germany

E-Mail presenting author: sophie-katherine.chisholm@chemie.uni-regensburg.de

From material science to catalysis, photoswitching cages in recent years have showcased their potential for new innovative applications [1]. Their confined cavities open and close in response to light and can further facilitate photochemical and catalytic reactions with high specificity and efficiency if tuned correctly [2], [3].

Figure 1:
Assumed inital structure of Azocage converted to unknown photostationary state (PSS). 340 nm and 455 nm light can be used respectively to switch between configurations.



We investigated a photoswitching cage with three azobenzene subunits (Azocage) displaying multiple photoinduced E/Z configurations (e.g. EEE, EEZ, EZZ, ZZZ). Variable factors such as temperature and solvent environment are assessed to elude photoswitching dynamics and intermediate structures during forward and reverse E-Z photoisomerization. Using 340 nm and 455 nm light, the assumed initial configuration can be switched back and forth between the photostationary state (PSS) (Figure 1). Advanced UV/Vis absorption techniques are employed to try distinguish the degree of E-Z isomerization. A comparison to azobenzene is made to reveal the similarities and differences between their behaviour. In turn, the results help assess the stability and structure of the PSS, thus find prospective applications.

[1] M. Gao, D. Kwaria, Y. Norikane, and Y. Yue, *Nat. Sci.* 2023, 3, e220020, doi: 10.1002/ntls.20220020.

[2] M. Ovalle, M. Kathan, R. Toyoda, C.N. Stindt, S. Crespi, and B.L. Feringa, *Angew. Chem. Int. Ed.* 2023, 62, e202214495, doi: 10.1002/anie.202214495.

[3] K. Artmann, R. Li, S. Juber, E. Benchimol, L.V. Schäfer, G.H. Clever, P. Nuernberger, *Angew. Chem. Int. Ed.* 2022, 61, e202212112, doi: 10.1002/anie.202212112