

More than the sum of its parts: A modular dihydroazulene-spiropyran photo switchable dyad

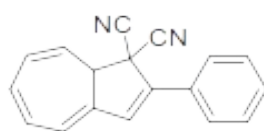
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Most photoswitchable molecules possess two (meta-) stable states. One method to increase the number of states in photochromes is to combine multiple switching units. Both, dihydroazulenes (DHAs) and spiropyrans (SPs) express unique switching properties. E.g., the photoreaction of DHAs is not photo-reversible, enabling full photoconversions. Besides photoswitching, the isomerization of SPs can be induced by other stimuli, such as pH, metal cations, mechanical force, etc.

By combining DHA and SP in a dyad, eight switching states are theoretically possible, accounting for photoswitching of DHA, and both, photo- and acid-switching of SP. In our model system, the two switching units maintain their switching properties. Thus, all eight states could be accessed. Simultaneously, the electronic coupling via an acetylene bridge between DHA and SP gave rise to a surprisingly intense fluorescence.

Synthetic variation of the system's geometry provides the possibility to investigate and tune the system's properties in regard of switching and fluorescence.



photochromic
2 states

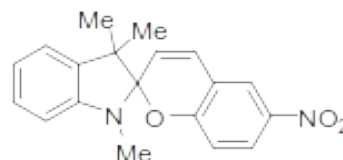


photo- & acidochromic
4 states

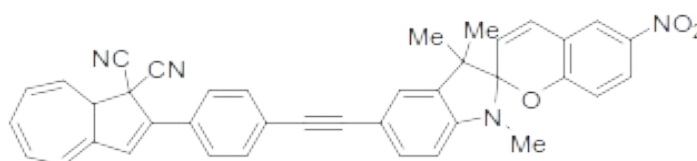


photo- & acidochromic
8 states

fluorescent

Ref.:

M. Dowds, S. G. Stenspil, J. H. de Souza, B. W. Laursen, M. Cacciarini, M. B. Nielsen, *ChemPhotoChem* **2022**, e202200152. DOI: 10.1002/cptc.202200152.