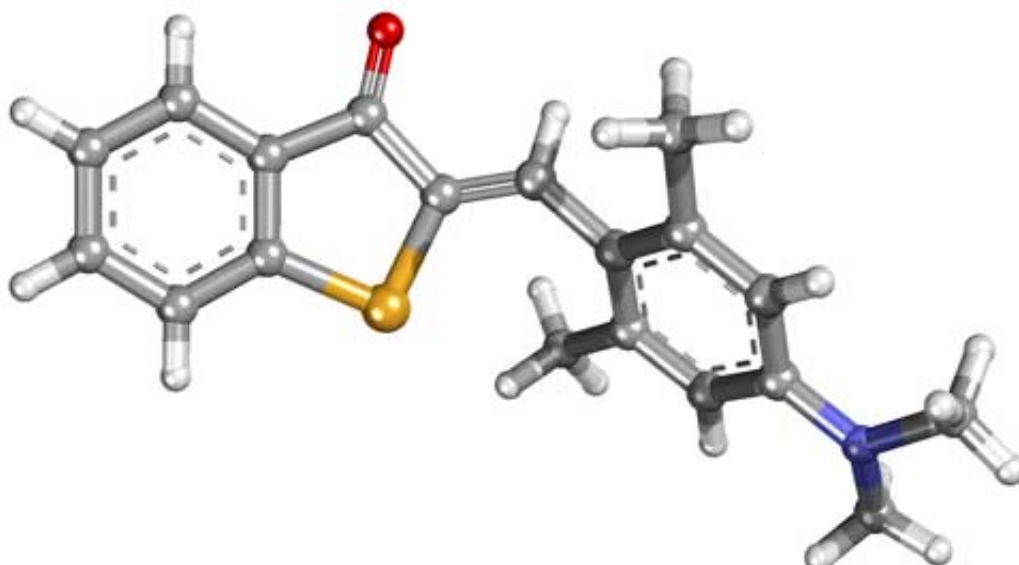


Scientists synthesize a new photo-activatable molecule

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Credit: Ludwig Maximilian University of Munich

LMU chemists have synthesized a new photo-activatable molecule, which shows 2-dimensional switching behavior – an essential prerequisite for the construction of complex molecular machines.

Molecular photoswitches are chemical structures whose geometry can be regulated by means of light. Now researchers led by Dr. Henry Dube at the Department of Chemistry at LMU have developed such a switch, whose movements can be controlled with unprecedented precision. "Our new photoswitch is a two-dimensional one. In contrast to most other

chemical switches, it can be operated in two modes," explains Henry Dube, who heads an Emmy Noether research group at LMU.

The switch is derived from a compound classified as a hemithioindigo, in which a so-called thioindigo moiety is linked via a carbon double [bond](#) (C=C) and a [single bond](#) (C-C) to a planar aromatic ring. This derivative reacts to light by altering the orientation of the [aromatic ring](#) in different ways depending on the nature of the medium in which it finds itself.

"And that allows us to control the intramolecular motion of the photoswitch with a degree of precision never before achieved for this class of molecules" says Dube. When the photoswitch is dissolved in the non-polar solvent cyclohexane, light causes rotation exclusively about the double bond mentioned above. In a polar medium such as DMSO (dimethylsulfoxide), on the other hand, the rotation occurs about the single bond in the linker. Moreover, the compound is the most efficient photoswitch of the hemithioindigo type yet developed," Dube adds.

The new findings appear in the *Journal of the American Chemical Society* and represent an important step toward the development of molecular components for the assembly of nanomachines: For the greater the degree of control available, the more complex are the functions that can be performed by such structures. Furthermore, Dube and his colleagues have determined why exactly the molecule behaves differently in solvents of different polarities. And their detailed understanding of the underlying reaction mechanism should enable the LMU researchers to apply this relatively simple way of controlling molecular motions to other types of [chemical switches](#).

More information: Sandra Wiedbrauk et al. Twisted Hemithioindigo Photoswitches: Solvent Polarity Determines the Type of Light-Induced Rotations, *Journal of the American Chemical Society* (2016). [DOI: 10.1021/jacs.6b05981](https://doi.org/10.1021/jacs.6b05981)

Provided by Ludwig Maximilian University of Munich

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