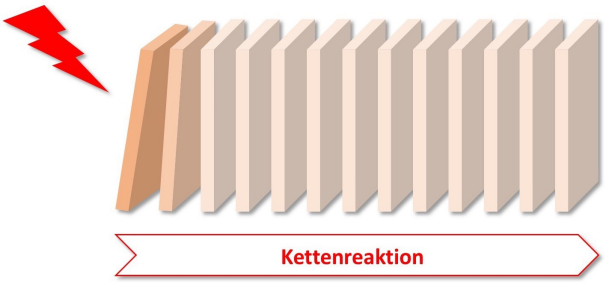
SCIENTIFIC HIGHLIGHT

Chain reaction switches molecules in depth

A new method developed by a team of chemists in Berlin open the door for using optically switchable molecules. The results of the study have been published in *Chem*.



Smart materials become increasingly common in our daily life as they adapt their properties to their surroundings, such as temperature and light. Think about light-adaptive lenses in sunglasses that change their color in response to brightness or darkness. In these materials, photoswitchable molecules able to change their properties, such as color or the ability to conduct electricity, upon illumination serve as key components. However, photoswitches typically require the use of high-energy UV light and in addition do neither switch quantitatively nor efficiently since many more quanta than molecules are needed. These drawbacks limit the applicability of photoswitches, in particular since the more energy-rich light is, the less it can penetrate into materials.

Now, chemists of Berlin's Humboldt University and the University of Potsdam have developed a method, which allows one to efficiently and quantitatively operate photoswitches with the smallest amounts of low-energy red photons, thus solving both issues described above. By coincidence they came across the phenomenon that the oxidation of only a few switch molecules was sufficient to switch the entire sample.

Subsequently, they investigated the underlying chain reaction in great detail and optimized it by introducing dyes to allow for the use of red light.
The latter allowed them to boost the quantum yield – typically way below 100% – to a record-setting value of almost 200%.

The impact of their discovery is tremendous according to Dr. Alexis Goulet-Hanssens and Prof. Stefan Hecht, who works at the Department of Chemistry and **IRIS Adlershof**: „With our method, for the first time we can address molecular switches deep in a material. Thus, we can operate optical devices efficiently but also penetrate deep into the skin through the biological window they explain and are excited about possible applications in optoelectronics as well as medicine.

Hole Catalysis as a General Mechanism for Efficient and Wavelength-Independent Z→E Azobenzene Isomerization
A. Goulet-Hanssens, C. Rietze, E. Titov, L. Abdullahu, L. Grubert, P. Saalfrank, and S. Hecht
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