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Photochromic materials: molecular and material design for optoelectronics and photopharmacology applications

Switching with light offers a palette of opportunities for photochromic materials. Light enables spatio-temporal control over the activation-deactivation of physical-chemical and biological functions. Photochromic molecular switches can be designed to be converted by any specific electromagnetic radiation of the entire UV-vis light spectrum. Color, transmittance, refractive index, dipole moment and electrical conductivity are some of the physical-chemical properties that reversibly change by irradiation with light of suitable wavelength because of an isomerization reaction that converts the reagent in a stable or metastable photoproduct [1]. Thanks to their modular synthesis, which enables the production of a wide range of functional compounds featuring good optical fatigue resistance, remarkable structural changes as well as fast responses, a variety of photochromic devices can therefore be designed and assembled. Their performances can then be further tuned and maximized through design optimization and material processing [2].

Photochromic molecules can have an impact on a wide range of applications in such diverse fields as optics, optoelectronics and, as more recently demonstrated, pharmacology and life science. Indeed, remote control of biological activity can enable targeted therapies based on small molecules and peptides as a new class of light-regulated drugs [3].

References

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