Molecular Switches in Solid Media (Yeda)
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Rafal Klajn, Chemistry, Organic Chemistry

Summary

Molecular photoswitches are light-responsive molecules with potential applications in a broad range of systems with on-demand functionalities. While molecular photoswitches have been extensively studied in solution, their immobilization to dry, planar surfaces generally renders them photochemically unresponsive. This invention presents a technique for modification of dry surfaces to render them amenable to molecular switch integration. Dry surfaces are coated with a transparent, nanoporous fiber network onto which molecular photoswitches are dispersed. Tested photoswitches demonstrated high-density loading, retained their activity, and proved stable over time. The proposed technique promises to expand the applicability of photoswitches in a broad array of functional materials including flexible substrates, as well as to enable dry surface integration of other molecular switches operating on signals other than light.

Applications

Internet of things (IoT) technologies, e.g., software, services, connectivity and devices Electronics - data storage and logic components Construction - smart materials including smart windows Smart wearables Photosensors Biomedical arena - molecular recognition, therapeutics, diagnostics, photopharmacology Solid-state fluorophore platform

Advantages

Transparent filament networks preserve photoswitching efficiency High-density surface functionalization Filaments stable under a range of chemical, photochemical and heat conditions Facile and cost-effective network production and integration

Technology's Essence

This invention preserves photoswitchability by derivatizing a broad range of surfaces with a thin (1 ?m) nanoporous polysiloxane (silicone) network layer. The silicone network is both transparent, ensuring maximal light transmission, and highly hydrophobic, enabling its interaction with a wide range of molecular switches. Moreover, its large surface area allows for high-density adsorption, up to two orders of magnitude higher than untreated surfaces. Model glass substrates roughened with polysiloxane nanofilament networks and doped with molecular switches displayed excellent photoswitchable properties, which were maintained for a similar number of cycles as in liquid medium. Nanofilament fibers were found to be stable for over one year with no functionality deterioration at room temperature, and promising heat stability results were obtained for up to 800 0C.

Contact for more information:
Maya Gofer ,   Licensing Officer,   +972-8-9344546

Yeda Research and Development Co. Ltd. - Technology Transfer from the Weizmann Institute. P.O. Box 95, Rehovot,76100, Israel. Tel: +972-8-947-0617