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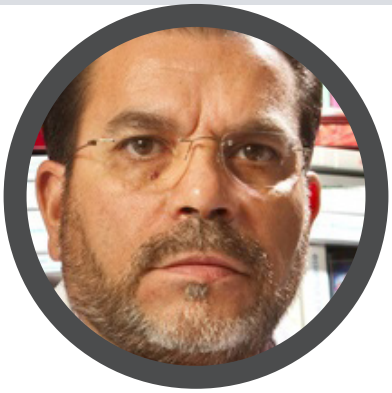
MECHANICALLY INTERLOCKED MOLECULES OF FULVALENE-ROTAXANE-CATENANE: A VALUABLE TOOL IN THE SUSTAINABLE MANAGEMENT OF CROP PROTECTION AGAINST DAMAGE BY UV RADIATION



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Due to damage of the ozone layer, the level of ultraviolet (UV) radiation reaching the biosphere is increasing. High levels of UV radiation can cause photo-oxidative stress in plants affecting the development of plants and decreased photosynthesis as well as reduced biomass. Moreover, the photochemical efficiency of chloroplast photosystems can be inhibited by broadband UV radiation. Sites that are affected by this type of light are the light collector complex II (LHCII), the photosystem II (PSII) reaction center and photosystem I (PSI) acceptor. The development of alternative strategies to protect plants against damages by UV is therefore an issue of increasing urgency. Through research and development in crop protection, innovation has developed a cluster of selenium, nickel, titanium and polyoxomolybdates, which constitute the molecular structures of fulvalene-rotaxane-catenane, these compounds are reversibly converted between a high energy and a low energy isomer, thus making it a possible candidate for molecular solar thermal energy storage. The fulvalene-rotaxane-catenane structures induced the construction of a supramolecular dendrimer involving orthogonal binding motifs (hyperbranched macromolecules, constituted of repetitive monomeric units as polymers), that enables to optimize the photosynthetic light capture, storing and maintaining more available power provided by the monochromatic beam of light of wavelength 563 nm. Foliar application of these compounds can prevent the growth inhibition and thylakoid membrane photodamage caused by solar radiation. Therefore, these compounds improve the photosynthetic efficiency and serve as a reserve material that can be used to allow plants to survive starvation induced by darkness.

Biography

Luis Alberto Lightbourn Rojas is the President of the Instituto de Investigación Lightbourn located at Mexico. He is an Expert in plant biotechnology, genomics, cell biology and has over 30 years of experience in plant biochemistry and molecular biology. Throughout his research career, he has focused on how light regulates plant growth and development. He has made a major contribution in understanding the molecular responses of plants to ultraviolet radiation. He has a range of expertise that has attracted invitations to contribute to a wide range of activities, including assessment of research strategy, industry consultation and govern.

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