International Year of Light and Light-Based Technologies

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The UN General Assembly recognised the importance of light and its applications in our daily lives and proclaimed 2015 as the International Year of Light and Light-Based Technologies (IYL 2015).[1] The International Year of Light celebrates light sciences to provide awareness on how light can promote sustainable development and provide solutions to current and future challenges. Light is a truly multidisciplinary area in science and finds applications in chemistry, physics, medicine, and energy (among others).

This special issue highlights achievements in research from across the globe in photochemistry, where light induces chemical reactions, and photophysics, where light interacts with matter to luminesce and/or convert to energy, for the sustainable production of medicines and the advancement of modern technology.

Light often allows for the synthesis of complex target compounds under sustainable conditions with the ‘flick of a switch’. Photochemistry has thus enriched the synthetic chemistry portfolio. Selected applications of TiO2 photocatalysis in organic synthesis are reviewed by Norbert Hoffmann.[2] Eietsu Hasegawa and Shin-ya Takizawa highlight examples of 2-aryl-1,3-dimethylbenzimidazolines as effective electron and hydrogen donors in photoinduced electron-transfer reactions.[3] In a subsequent paper, Hasegawa and co-workers utilise these compounds for the visible light-promoted metal-free reduction of organohalides.[4]

The area of continuous-flow photochemistry continues to grow with three contributions in this special issue. Sunlight-induced benzylic brominations are successfully realised in a capillary microreactor by Chan Pil Park and co-workers.[5] Shimichiro Fuse and colleagues demonstrate an efficient multistep Arndt–Eistert synthesis in a microflow system without isolation of intermediates.[6] Photodecarboxylative benzylations are successfully optimised by Michael Oelgemöller and co-workers under batch conditions and subsequently transferred to an advance continuous-flow photoreactor module.[7] Yasuharu Yoshimi and his group utilise photodecarboxylations for the generation of carbanions, which are subsequently trapped by benzaldehyde.[8] Unusual molecular architectures are realised by Andrei Kutateladze and co-workers via intramolecular cycloadditions of photogenerated azaxyllyenes.[9] Thorsten Bach’s team performs enantioselective photorearrangements of spirooxindole epoxides catalysed by a chiral bifunctional xanthone and obtains the corresponding products in high yields and moderate enantioselectivities.[10] Likewise, Tadashi Mori and colleagues examine the effect of environmental and experimental factors on the diastereoselectivities of the Paternò–Büchi reaction of chiral cyanobenzoate.[11]

Light can also be used to generate and study reactive intermediates. Manabu Abe and co-workers are able to simultaneously observe triplet and singlet cyclopentane-1,3-diradicals.[12] The formation and direct detection of a...
non-conjugated triplet 1,2-biradical is furthermore described by Anna Gudmundsdottir and her group.\[14\] Rosalie Hocking and co-workers describe the structural effects of sodium birnessite-based films to improve solar fuel technology.\[15\] George Vamvounis and Nicholas Sandery explore the use of photochromic compounds as colorimetric sensors for trinitro-toluene-based explosives.\[16\]

Photophysics of materials is important for the development of new technologies such as light-emitting devices (LEDs), which convert electrical energy into light. The production of efficient LEDs is underpinned by the development of novel solid-state phosphorescent materials. To that end, Florian Baur and Thomas Jüstel report the effect of host materials of new lanthanide-based red phosphors on the phosphorescence efficiency.\[17\] Furthermore, Peter Junk, Ulrich Kynast, and co-workers discuss the important structural effects of sodium birnessite-based films to improve solar fuel technology.\[15\]

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References