



International Conference on Chemistry for Human Development (ICCHD-2020)

Date: 9th-11th January, 2020, Venue: Heritage Institute of Technology, Kolkata

Low Energy Light-Driven Unorthodox Catalysis Processes

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Visible light assisted photoredox catalysis^{1a} such as oxidation of alcohols,^{1b} α -haloesters,^{1c} arylboronic acids,^{1d} has gain much interest for the activation of organic molecules during last few years. Generally, transition metal-ligand complexes are more effective photocatalysts for proton-coupled electron transfer depending on their E^0 values.^{1e} Organic dyes such as Eosin Y and Rose Bengal are more attracting as a sustainable light absorbers for visible light driven catalytic organic transformations. Technological progress and broad commercial availability of light-emitting diodes that are able to provide high-intensity visible light in a narrow wavelength range for all colors have made ideal cheap and energy-efficient light sources available for photocatalysis. So far, the visible-light photocatalytic reactions are exploited for radical transformations.^{1f} For general and industrial application of photocatalysis we should figure out simple processes which will follow ionic, carbene and nitrene mechanisms. Recently we found the activation of λ^3 -hypervalent iodine under blue LED light and established an unorthodox stereoselective cyclization strategy for synthesis of functionalized diaziridines via C-C cleavage and subsequent grafting of methylene analogues with aliphatic amines using Rose Bengal. sp^3C-H activation with multi N-C/C-C coupling under the non-metallic conditions led us to achieve tetrahydropyrimidine derivatives. A metal-light dual catalysis for simultaneous C-C cleavage and C-N coupling discovered for the direct synthesis of α -ketoamides and α -ketoesters using a combination of Cu(I)-Eosin Y.

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