Invited Lecture
57th Annual Convention of Chemists (ACC) - Indian Chemical Society (ICS)
Recent Trends in Chemical Sciences (RTCS 2020)

Diverse Photocatalysis for Common Reaction Pathway

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Abstract:
A number of photoredox strategies for organic syntheses have been reported such as the direct excitation of substrates by highly energetic-ultraviolet light, abundant sunlight, and recently developed, energy-efficient, light-emitting diode (LED) sources.[1] Despite the great potential for using inexpensive and nonhazardous organic photocatalysis in synthesis, visible light-driven photocatalysis is still not a common tool for organic synthesis in either academia or industry.[1b] The limited usage of this strategy is due to drawbacks, including generally following radical mechanisms and slow reaction rates, and more importantly, the reactions typically do not pass through nitrenes, carbenes, ions or other common reaction pathways. The light-activated photocatalysis is not viable for large-scale and industrial processes mainly because of its critically unsafe nature due to the generation of large quantities of unstable radical intermediates, and its inability to access labile and/or chiral compounds.

We recently addressed a non-metallic photocatalysis to generate nitrene intermediates through reactions of 1,2-diols and aliphatic amines under mild reaction conditions for rapid synthesis of functionalized 1,2-disubstituted diaziridines, chiral and 1,2,3-trisubstituted analogues with excellent reaction rates, yields, and stereoselectivities.[2a] We have also developed a metal-catalyzed rapid $COCH_2$-amidation merged with another organophotocatalyst under mild conditions for production of labile□□-ketoamides, unsymmetrical oxalamides and chiral analogues.[2b] The current strategies open up new avenues to making photocatalysis a common synthetic tool for large-scale production in academia and industry.

References and Notes:

1. (a) Terrett, J. A.; Cuthbertson, J. D.; Shurtleff, V. W.; MacMillan, D. W. C. *Nature* **2015**, *524*, 330. (b) König, B. *Eur. J. Org. Chem.* **2017**, *2017*, 1979.

2. (a) Mandal, R. R.; Khamrui, S.; Maiti, D. K. *Org. Lett.* **2017**, *19*, 5964 (***Editor's Choice***). (b) Ghosh, D.; Nandi, R.; Khamarui, S.; Ghosh, S.; Maiti, D. K. *Chem. Commun.* **2019**, *55*, 3883 (***Hot Paper***).

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Bio-Sketch of Speaker

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Dr. Maiti graduated with B. Sc. Chemistry (Hons.) from Ramakrishna Mission Vidyamandira (1991) and M.Sc. degree (Organic Chemistry Major) from Calcutta University (1993), and obtained Ph.D. degree in synthetic organic chemistry from Indian Institute of Chemical Biology in 1998 (Jadavpur University), India. He had joint as a scientist in the R & D of Ciba India Pvt. Ltd. (Mumbai) in 1998 and subsequently moved to RPG Life Sciences Ltd. (Navi Mumbai) in 1999. He held postdoctoral positions at the School of Medicine, Wayne State University, USA (2002-2004). He joined in the University of Calcutta on 2005 and now he is a full Professor.

His research interests include diverse catalysis, photocatalysis, C-H activation, NHC guided reaction, annulation reaction, synthesis of sugar-based chiral heterocycles, organic transformation in water medium, surfactant chemistry, fabrication of nanomaterials, nanocatalysis, mechanistic study, NMR and other spectroscopy, fabrication of organic nanostructured materials, development of sensors, inkless writing materials, organic nanoelectronics and memory devices.

He is associate editor of Scientific Reports of Nature Publishing group (NPG), Editor-in-Chief of Journal of Chemistry and Applied Biochemistry, and advisory committee member of seventeen international journals. He is a Fellow of Royal Society of Chemistry (FRSC), London. He has guided more than 70 Ph.D. students and postdocs, and published more than 100 papers in the reputed international journals.