

The Application of Photoredox Catalysis to New Transformations in Chemical Synthesis

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Abstract. This lecture will discuss the advent and development of new concepts in chemical synthesis, specifically the combination of photoredox catalysis with organic catalysis. This new approach to “synergistic catalysis” will demonstrate that multiple yet separate catalytic cycles can be aligned to generate activated intermediates that rapidly combine with each other, thereby enabling the development of many new C–C and C-heteroatom bond forming reactions.

We will also introduce an approach to the discovery of new chemical reactions that we term accelerated serendipity. Accidental or ‘serendipitous’ discoveries have led to some of the most important breakthroughs in scientific history, many of which have directly affected human life. Given our overarching goal of developing fundamentally new and useful chemical transformations using catalysis and by acknowledging the tremendous impact of serendipity in scientific discovery, we questioned whether this phenomenon could be forced or simulated and therefore employed as a tool for reaction discovery.

In this presentation, we will also describe why serendipitous reactions and a detailed understanding of their mechanistic underpinnings can allow the invention and development of many photoredox transformations that are now being applied widely in the pharmaceutical and fine chemical areas.

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