Synlett Lecture

University of Padua – May 22, 2025

Professor David A. Nicewicz

William R. Kenan,
Jr. Distinguished Professor of Chemistry

University of North Carolina

Chapel Hill, North Carolina, USA

New Avenues in Synthesis via Organic Photoredox Catalysis

Abstract

Single electron pathways are common in the biological realm and are integral to photosynthesis and physiological processes in humans. As synthetic chemists, we seek to harness the power of single electron mediated pathways to more efficiently make the pharmaceuticals, agrochemicals and materials that the modern world requires. My group seeks to use organic salts as excited state catalysts to mediate single electron processes in the development of new chemical transformations. This lecture will give a brief background to organic photoredox catalysis and cover some of the reactivity from my group including C-H functionalization chemistry, alkene functionalization and application of organic photoredox catalysis to radiolabeling and targeted radiotherapeutics.

Bio

Prof. David A. Nicewicz completed his Bachelor's (2000) and Master's (2001) degrees in Chemistry at the University of North Carolina at Charlotte with *Professor Craig A. Ogle*. He then moved to the University of North Carolina at Chapel Hill where he completed his Ph.D. in 2006 with *Professor Jeffrey S. Johnson*. His graduate research focused on *novel Brook Rearrangement transformations* and compleed the total synthesis of *Zaragozic Acid C*. Following his graduate education, Nicewicz was a Ruth L. Kirschstein Postdoctoral Fellow in the laboratories of the *2021 Chemistry Nobel Laureate*, *Professor David W. C. MacMillan*. It was during this time that Nicewicz pioneered the use of *ruthenium photoredox catalysis* in combination with chiral amine organocatalysis to develop a general method for enantioselective aldehyde alkylation and more importantly, establishing photoredox catalysis as an emerging tool in organic synthesis.

In 2009, Nicewicz started his independent career in the Department of Chemistry at the University of North Carolina at Chapel Hill, where he rose through the ranks and was named the first Royce Murray Term Professor of Chemistry at UNC Chapel Hill in 2020. In 2024, he was named the W.R. Kenan, Jr. Distinguished Professor.

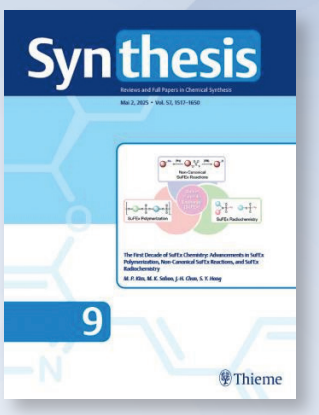
His research focuses on using small organic dyes as excited-state single electron photoredox catalysts to discover and invent new chemical transformations. His collaboration with Prof. Zibo Li (UNC Radiology) has spawned an area of the application of photoredox catalysis for radiolabeling of small organic molecules for applications to positron emission tomography and has co-founded two companies based on this technology.

25P2XT - IV 2025

Thieme

Synthesis Lecture

University of Padua – May 22, 2025




© Thieme/privat

Prof. Dr. Xin-Yuan Liu

Chair Professor and Department Head of Chemistry

SUSTech
(Southern University of Science and Technology)

Shenzhen, Guangdong, China

Cu/Chiral Anionic Ligand-Catalyzed Enantioselective Radical Reactions

Abstract

Radical reactions have emerged as one of the most powerful and efficient tools for the construction of carbon–carbon and carbon–heteroatom bonds in organic synthesis. However, the development of catalytic asymmetric radical reactions to realize the stereochemical control of open-shell intermediates still remains a formidable challenge owing to the high reactivity of such free radical species. To solve this problem, our group has developed copper(I)/chiral anionic ligand catalyst to achieve a number of enantioselective radical transformations: such as the C–H functionalization, alkene difunctionalization and cross-coupling of alkyl halides, etc. The role of chiral anionic ligand is dual: it not only tunes the reducing capability of copper for the reaction initiation but also provides excellent stereocontrol induction of the reactive radical species through multiple models.

Bio

Prof. Dr. Xin-Yuan Liu obtained his B.S. degree from Anhui Normal University in 2001. In 2004, he obtained his Master's degree in Science from a joint program between Anhui Normal University and the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences. He then completed his PhD at the University of Hong Kong in 2010. From 2010 to 2012, he conducted postdoctoral research at both the University of Hong Kong and The Scripps Research Institute in the United States. In 2012, he joined the Department of Chemistry at SUSTech as an Associate Professor, where he was promoted to Professor in 2018 and to Chair Professor in 2022.

As the corresponding author, he has published over 110 papers on „Asymmetric Catalytic Radical Chemistry" in top-tier journals such as Science(1), Nature (1), Nat. Chem. (4), Nat. Catal. (2), Nat. Synth. (2), Chem (2), JACS (13), Angew. Chem. (21), etc.

Owing to his great contribution to the field of the radical asymmetric chemistry, he has obtained many honors and awards, such as XPLORER prize, The First-Class Prize of the Natural Science Award of Guangdong Province, Boehringer Ingelheim Lectureship (Boston College), CCS-BASF Innovation Prize, CCS Youth Chirality Award, The Distinguished Lectureship Award (Chemical Society of Japan), Award for National Excellent Young Scholar (NSFC), The Scholar Program-Youth Project (Ministry of Education, China), CAPA Distinguished Faculty Award (CAPA), ACP Lectureship Awards (Taiwan District and Japan), The National Science Fund for Distinguished Young Scholars (NFSC), etc.

25P2XT - IV 2025

Thieme