



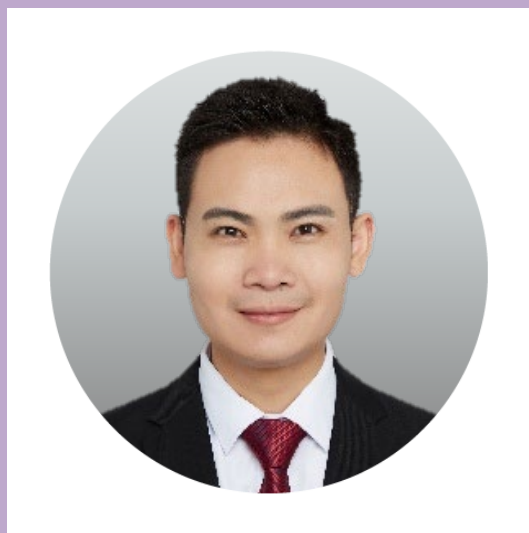
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Department of Chemistry

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Department of Chemistry Research Seminar Series



Silicon Effect-Directed Synthesis of Organofluorine Compounds

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Advanced Studies
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Silicon Effect-Directed Synthesis of Organofluorine Compounds

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Organofluorine molecules play an indispensable role in life sciences and materials science. However, organic fluorine compounds are extremely rare in nature, where fluorine primarily exists in inorganic forms such as fluorite. The vast majority of organic fluorine compounds must be synthetically produced. Consequently, the development of novel fluorination reagents and reactions has long been a frontier research direction in synthetic chemistry. The construction of innovative fluorine-containing molecular architectures can provide new strategies for drug chemists and materials scientists in functional molecule design, while advances in fluorination methodologies may offer pathways to circumvent existing synthetic patents for pharmaceutical molecules.

In exploring strategies for the precise synthesis of organofluorine compounds, we observed a previously overlooked silicon effect in synthetic chemistry: the ability of a silyl group to stabilize α - and β -carbon radicals. Although this "silicon effect" has been documented in the literature (1), its potential in synthetic chemistry remains significantly underexplored. This presentation will introduce a series of new reactions developed by our group utilizing the "silicon-stabilization of adjacent radicals" strategy, enabling controlled generation and transformation of monoradicals, diradicals, carbenes, and ketenes, along with their applications in the precise synthesis of organofluorine compounds (2).

Keywords: fluoroalkylation, silicon effect, radical, carbene, ketene, photocatalysis

Reference:

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Xiao Shen is currently a Professor and Doctoral Supervisor at the Institute for Advanced Studies, Wuhan University. He earned his Ph.D. in 2013 from the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, under the supervision of Professor Jinbo Hu. From 2014 to 2017, he conducted postdoctoral research at Harvard University with Professor Tobias Ritter and at Boston College with Professor Amir H. Hoveyda.

In August 2017, he was appointed as a "Hongyi Young Scholar" Professor at Wuhan University. He was selected for the Young Thousand Talents Program in 2018. In 2022, he obtained funding as the Principal Scientist of a National Key R&D Program Young Scientist Project.

His awards include the Thieme Chemistry Journals Award and the Hubei Province Young Innovation Award in Chemistry and Chemical Engineering (2023), as well as the Royal Society of Chemistry (RSC) Fluorine Chemistry Prize, the Wuhan University May Fourth Youth Medal, and the Asian Core Program Lectureship Award (Hong Kong) in 2025.

He currently serves on the advisory boards of several journals: *Chem Catalysis* (Advisory Editorial Board), *Organic Chemistry Frontiers* (Young Advisory Board), *Science China Chemistry* (Young Editorial Board), *Chinese Chemical Letters* (Young Editorial Board), and *Youji Huaxue* (有机化学) (Young Editorial Board).

His research program focuses on the design and development of novel synthetic methodologies and innovative reagents, with particular emphasis on addressing fundamental challenges in modern synthetic organic chemistry. Since returning to China, he has published over 40 papers as a corresponding author in prestigious journals including *Nat. Synth.*, *Chem*, *J. Am. Chem. Soc.*, *Angew. Chem. Int. Ed.*, *Nat. Commun.*, *Sci. Bull.*, and *CCS Chem*.