

## Recent Advances in Functional Group Transfer Catalysis

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Functional group transfer catalysis is one of the most powerful tools in modern organic synthesis, as it often enables the mild and efficient incorporation of specific functional groups while allowing for facile and atom-economic molecular modifications. Our group's interest in advancing this field lies at the intersection of designing novel functional group transfer reagents (FGTRs) and developing innovative catalytic strategies powered by sustainable energy sources, including visible light, electricity, and mechanical energy, to assemble carbon-nitrogen [1], carbon-oxygen [2] and carbon-halogen [3] bonds.

In this lecture, I will discuss our recent efforts in developing sustainable, robust, and catalytic concepts, with an emphasis on nitro group transfer using both newly designed organic-based and classical inorganic reagents. Through diverse activation modes, these readily available and bench-stable reagents serve as controllable sources of nitro group in the form of nitryl radicals or nitronium ions, allowing to safely carry out previously unprecedented transformations in chemo-, regio-, and stereoselective manner and under non-acidic, mild reaction conditions. For example, photo- [4], electro- [5], or mechanochemical [6-7] activation of these reagents enables various nitrative (di)functionalization reactions of unsaturated hydrocarbons via radical-polar crossover (RPC) and metal-mediated radical ligand transfer (RLT) catalysis. The versatility of these reagents in molecular design will be demonstrated through Lewis acid catalysis for the functionalization of small, medium, and large (hetero)aromatic compounds, including the synthesis of biorelevant structures [8-9]. Additionally, select examples of the electron-catalysis paradigm for functional group transfer will be presented, supported by mechanistic insights based on both experimental and theoretical evidence.

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