Old dogs, New tricks: New Horizons in Group-1 Metal Chemistry and Applications in Sustainable Synthesis

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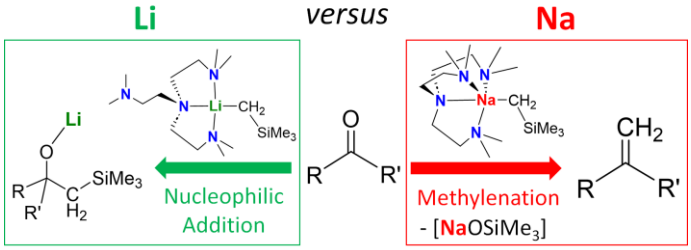
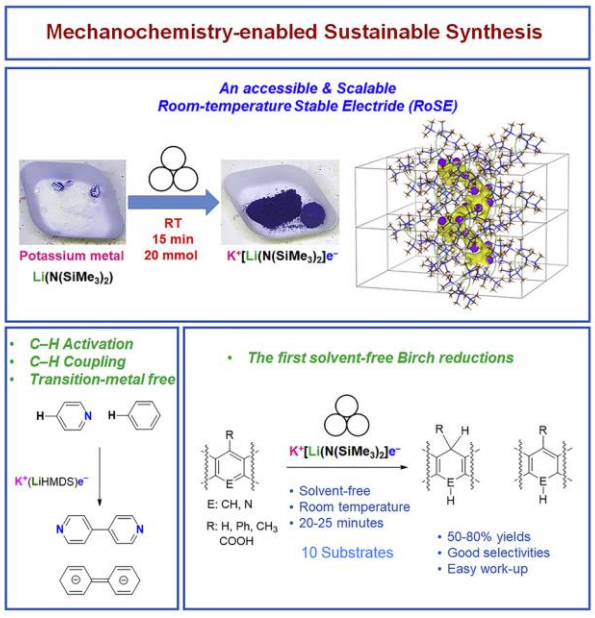
Despite their long history, ubiquitous natural presence (e.g., NaCl) and widespread applications in synthetic chemistry (e.g., ^{n}BuLi), our understanding of alkali metal chemistry is far from well-developed. Herein, we are reporting new frontiers in this field:

(1) Li vs Na: Distinct Organosodium Reactivity in C=O Bond Olefination



A paradigm in organo-alkali metal chemistry is that the metal identity underpins their reaction rate (fast or slow), but plays less important roles in determining their reactivity pattern. Our recent work changed the paradigm by reporting the first "sodium-only" reactivity: C=O methylenation.[1] Follow-up works from the Lu Group expanded the olefination methodology,[2] and mapped out the metal identity-ligand relationship.

(2) Room-temperature Stable Electride (RoSE) in Solvent-free Organic Synthesis



Traditional chemical reductants, such as Li/Na-NH_3(liquid), suffer from sustainability disadvantages and high cost. And, after all, almost all the reductions have to be conducted in bulk organic solvents. Recently, the Lu Group reported a new concept reductant RoSE, which unlocked the first solvent-free Birch reduction and mild benzene coupling.[2] Moreover, using the RoSE as a gateway, the Lu group proved the concept of selectively reduction of alkali metal cations, unlocked the route to zero-valent alkali metal chemistry.[3]

1) N. Davison et al., *J. Am. Chem. Soc.* **2023**, *145*, 6562. 2) N. Davison et al., *Chem* **2023**, *9*, 576. 3) N. Davison et al., *J. Am. Chem. Soc.* **2023**, *145*, 17007.