Exploiting the Reactivity of Hypervalent Bonds and Strained Rings for Reaction Discovery

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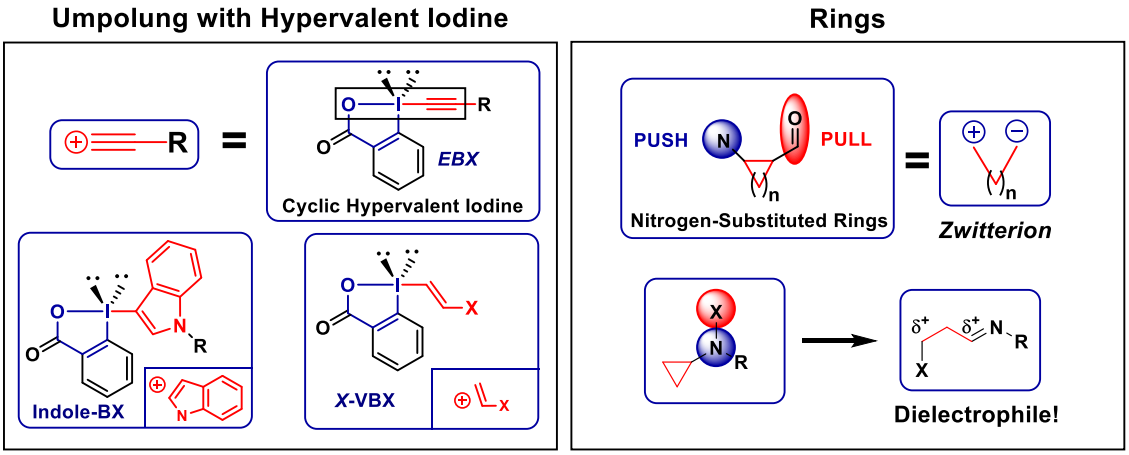

A fast access towards organic molecules of increasing complexity is one of the major motors of progress in multiple fields of fundamental and applied science, such as chemical biology, drug discovery or organic materials. To answer this need, our group develops new reactions based on the exceptional reactivity of hypervalent iodine reagents and aminocyclopropanes.

Hypervalent Iodine Reagents: The non-classical four-electron three-center bonds of hypervalent iodine reagents are weaker than normal classical bonds. This confers an exceptional reactivity to these compounds as oxidants or atom-transfer reagents. Cyclic hypervalent iodine reagents are especially interesting, as they combine enhanced stability with unique opportunities for reactivity modulation.[1] In particular, our group has been interested in the development of alkynylation methods by using cyclic EthynylBenziodoXolone (EBX) hypervalent iodine reagents (Figure 1).[2] The use of cyclic hypervalent iodine reagents is not limited to alkynylation. Recently, we also demonstrated their application for azidation and cyanation, as well as for the Umpolung of indoles and pyrroles,[3] and the functionalization of biomolecules.[4]

Aminocyclopropanes: Activation of cyclopropanes with an amino and a carbonyl group gives access to formal zwitterionic intermediates, which can be used in cyclization and annulation reactions.[5] Our group developed enantioselective methods based on either a dynamic kinetic asymmetric transformation or a desymmetrization approach.[6] Recently, we introduced another strategy starting from donor-only aminocyclopropanes for the formation of formal dielectrophilic synthons.[7]

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