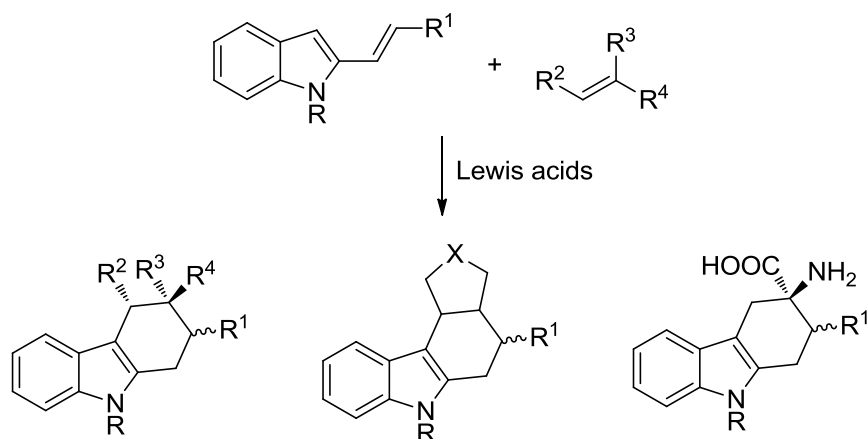


A brief journey from Lewis acids to Gold(I) and Gold(III) catalyzed cycloaddition/cyclization reactions of vinyl indoles with unsaturated compounds

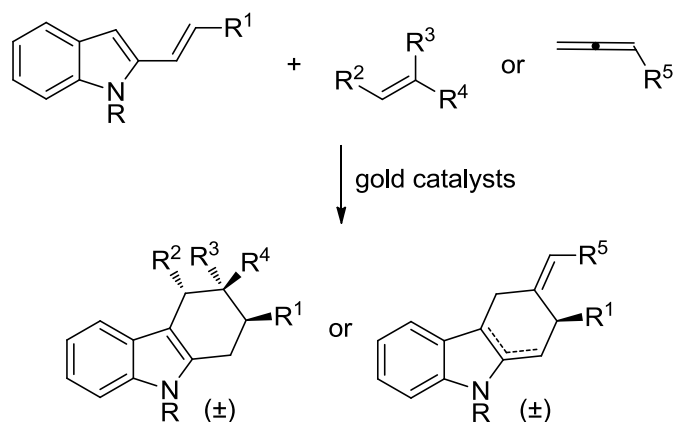
[4+2] cyclization/cycloaddition reactions are among the most useful transformations in synthetic organic chemistry. They are a widely used method for the assembly of simple and complex six membered carbo- and heterocyclic compounds. The reaction outcome (regio-, diastereo- and enantioselectivity) is modulated by the substituents on both the diene and the dienophile partners and by the design of different catalytic species. In particular, among dienes, internal-external ring dienes represent a class of very useful and versatile molecules. Their participation as 4π -components in cyclization/cycloaddition reactions allows for the construction of complex polycyclic compounds.

During the last ten years we developed several strategies to access carbazole derivatives through [4+2] cyclization/cycloaddition reactions of 2-vinylindoles with a plethora of unsaturated compounds. Starting from Lewis acids catalyzed reactions with cyclic and acyclic dienophiles, tetrahydrocarbazoles, [c]-annulated tetrahydrocarbazoles and constrained analogues of tryptophan were synthesized with good diastereoisomeric excess, scheme 1.¹



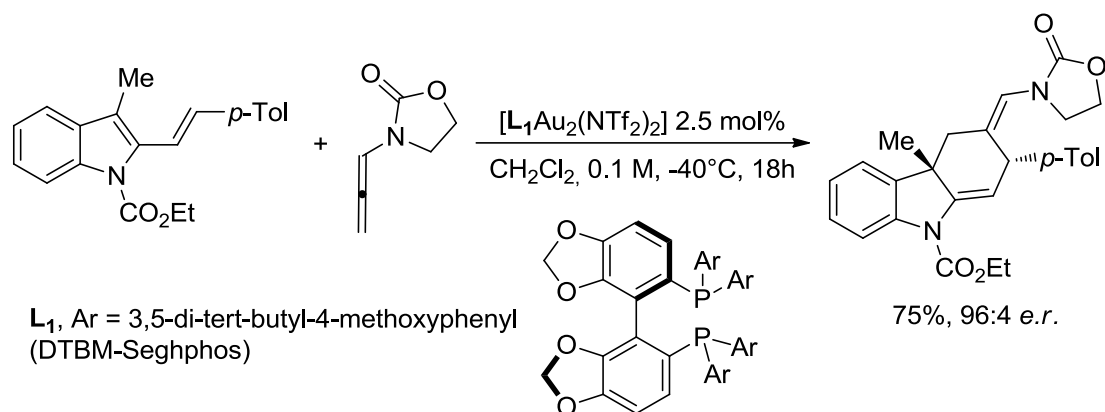
Scheme 1

More recently, application of cationic gold(I) and gold(III) catalysts both as σ and π activators in related transformations allowed for the construction of more complex and intriguing architectures also in a stereocontrolled fashion, scheme 2.²



Scheme 2

Now we are pleased to report our findings on dearomative cycloaddition reaction of 3-substituted-2-vinylindoles with allenamides under chiral cationic gold(I) catalysis, scheme 3.



Scheme 3

The reaction allows for the synthesis of 4,4a-dihydro-2H-carbazole derivatives in enantiomeric ratio up to 96:4 using DTBM-Seghphos as chiral ligand. The obtained results are particularly noteworthy as polycyclic structures arising from indole dearomatization have been tested as promising therapeutic agents and could serve as scaffold for the assembly of complex alkaloids skeletons.³ A complete survey of catalyst/ligand screening as well as scope and proposed reaction mechanism will be reported.

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