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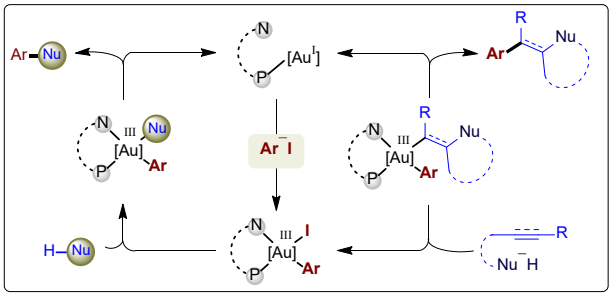
Ligand-Enabled Oxidative Gold Catalysis

ABSTRACT: The past two decades have remodelled the impression of gold from being an exorbitant glittery metal to the best catalyst for the activation and functionalization of various C–C multiple bonds. However, in spite of the reasonable efforts, the applicability of gold catalysis to the highly important cross-coupling reactions has remained highly limited. A prime reason for this is gold's reluctance to undergo the necessary oxidation state changes (Au: E^0 = +1.41 *vs* Pd: E^0 = +0.92 V) to catalyze cross-coupling reactions. With due credit to the pioneering work from the groups of Toste, Zhang, Hashmi and Glorius, two major strategies for achieving the inevitable Au(I)/Au(III) cycle have been developed which include: (a) External oxidant empowered Au(I)/Au(III) catalysis, (b) Au(I)/Au(III) Catalysis via merged gold/photoredox strategy.[1] Recently, our research group introduced an entirely new strategy wherein the use of benziodoxolones facilitates the Au(I)/Au(III) catalysis.[2]

In this presentation, I will be discussing a new mode of harnessing Au(I)/Au(III) catalysis wherein an ancillary P,N-ligand lowers the activation barrier for the oxidative addition of aryl halides to Au(I) and stabilizes the resulting Au(III)−aryl complex by P,N-coordination. The approach opens up new gateways for the development of enantioselective transformation by designing novel chiral P,N-ancillary ligands. Our explorations in the field of ligand-enabled Au(I)/Au(III) catalysis for achieving cross-coupling as well as 1,2-difunctionalization reactions of C-C multiple bond shall be discussed.[3]

Scheme 1. Gold-catalyzed reactions *via* ligand-enabled Au(I)/Au(III) catalysis



BIO: His broad research interests include development of metal-, organo- and organo/metal-catalyzed enantioselective methods and total synthesis of natural products. He has been the recipient of SERB Distinguished Investigator Award – 2018, CRSI Bronze Medal-2018, INSA Young Scientist Medal – 2010, Alkyl Amines – ICT Foundation Day Young Scientist Award – 2010 and Avra Young Scientist Award - 2012. He has also served as "Young Associate" of the Indian Academy of Sciences, Bangalore for the years 2010-2013. Recently, he was elected as a Fellow of The National Academy of Sciences (FNASc).

1. Review: Akram, M. O.; Banerjee, S.; Saswade, S. S.; Bedi, V.; Patil, N. T. *Chem. Commun.*, **2018**, *54,* 11069.
2. a) Banerjee, S.; Patil, N. T. *Chem. Commun.*, **2017**, *53,* 7937; b) Banerjee, S.; Senthilkumar B.; Patil, N. T. *Org. Lett.*, **2019**, *21,* 180.
3. a) Akram, M. O.; Das, A.; Chakrabarty, I.; Patil, N. T. *Org. Lett.*, **2019**, *21*, 8101; b) Chintawar, C. C.; Yadav, A. K., Patil, N. T. *Angew. Chem. Int. Ed.,* **2020**, *59,* 11808; c) Tathe, A. G.; Chintavar, C. C.; Bhoyare, V. W.; **Patil N. T.** *Chem. Commun.,* **2020**, *56*, 9304; c) Tathe, A. G.; Chintawar, C. C.; **Patil N. T.** *Manuscript Submitted.*