Guangbin Dong

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Scientific Vita

2023 – present	Weldon G. Brown Professor of Chemistry, University of Chicago, Chicago, IL
2016 – 2022	Professor of Chemistry, University of Chicago, Chicago, IL
2011 – 2016	Assistant Professor, University of Texas at Austin, Austin, Texas
2009 – 2011	Camille and Henry Dreyfus Postdoctoral Fellow, California Institute of Technology
2004 – 2009	Ph.D. in Chemistry, Stanford University, Stanford, California
1999 – 2003	B.S. in Chemistry, Peking University, Beijing, China

Research Field

Our research focuses on 1) developing new transition metal catalysts based on supramolecular chemistry for chemoselective C−H bond activation of small molecules; 2) developing novel catalytic C−H and C−C bond activation methods for efficient small-molecule agents synthesis; 3) establishing efficient synthetic routes to access natural products with high potent anticancer activity and their unnatural analogues; and 4) developing new methods for preparation of novel graphene nanoribbon materials from a bottom-up approach.

Awards and Recognition

Tetrahedron Young Investigator Award (2021), Chan Memorial Award in Organic Synthesis (2018), Blavatnik National Awards for Young Scientists, Finalist (2020, 2022), Arthur C. Cope Scholar (2017), Sloan Research Fellow (2014)

Representative Publications

1. Wu, Zhao; Xu, Xiaolong; Wang, Jianchun and Dong, Guangbin* “Carbonyl 1,2-transposition through triflate-mediated α-amination” *Science* **2021**, 374, 734-740.
2. Hairong Lyu; Kevlishvili, Ilia; Yu, Xuan; Liu, Peng* and Dong, Guangbin* “Boron insertion into alkyl ether bonds via zinc/nickel tandem catalysis” *Science* **2021**, *372*, 175-182.
3. Xu, Yan; Qi, Xiaotian; Zheng, Pengfei; Berti, Carlo C.; Liu, Peng;* Dong, Guangbin* "Deacylative transformations of ketones via aromatization-promoted C–C bond activation" *Nature,* **2019**, 567, 373-378.
4. Xia, Ying; Lu, Gang; Liu, Peng* and Guangbin Dong* “Catalytic Carbon–Carbon Bond Activation of Cyclopentanones” *Nature*, **2016**, 546-550.
5. Mo, Fanyang; Dong, Guangbin “Regioselective Ketone α-Alkylation with Simple Olefins via Dual Activation”, *Science*, **2014**, *345*, 68-72.

Merging C−C and C−H Activation: Palladium/Norbornene Cooperative Catalysis

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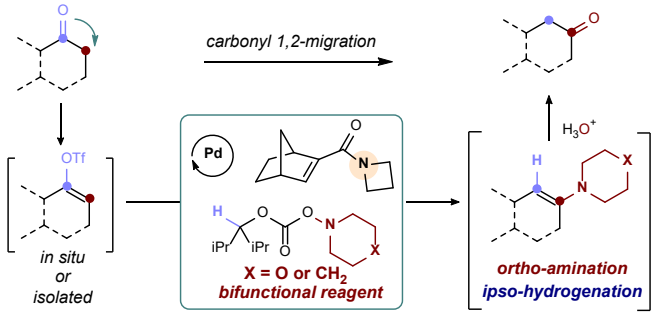
Achieving site-selectivity in arene functionalization that is complementary to the one from electrophilic aromatic substitution (EAS) reactions has been a long-standing quest in organic synthesis. The palladium/norbornene (Pd/NBE) cooperative catalysis potentially offers a unique approach to this problem, but its usage has been hampered by "three constraints": the electrophile constraint, the arene-substrate constraint, which is the requirement of using aryl iodides, and the "ortho constraint", which is the requirement of an ortho substituent for mono ortho functionalization of haloarenes. Here, we show that all these three constraints could be addressed through designing the electrophiles, phosphine ligands and norbornene ligands. Besides Catellani-type ortho alkylation and arylation, new ortho functionalization methods, such as ortho amination, acylation, carboxylation, thiolation and annulation, have been realized. In addition, using a unique phosphine system, various aryl bromides can be employed as the arene substrates. Moreover, a new class of bridgehead-modified NBEs overcomes the "ortho" constraint, thereby enabling a broadly useful strategy for arene functionalization with complementary site-selectivity to EAS reactions. A range of ortho-unsubstituted aryl iodides, previously problematic substrates, now can be employed to provide mono ortho functionalized products effectively. These methods are applicable for late-stage functionalization of complex bioactive molecules at positions that are difficult to be reached by conventional approaches. Beyond arene substrates, we also realized a non-intuitive transformation, that is to migrate ketone carbonyl to its adjacent position in one-pot through α-amination of alkenyl triflate. Conventionally, carbonyl 1,2-migration is a very tedious and less selective process, and generally takes 4-6 steps. This method not only provides a straightforward approach to access oxygen-transposed analogues, but also opens the door for a completely new type of carbonyl transformations.



References

1. Dong, Z.; Dong, G. *J. Am. Chem. Soc.* **2013,** *135,* 18350-18353.

2. Wang, J.; Dong, Z.; Yang, C.; Dong, G. *Nature Chemistry* **2019**, *11*, 1106-1112.

3. Wu, Z.; Xu, X.; Wang, J.; Dong, G. *Science* **2021**, *374*, 734-740.