

Naohiko Yoshikai

Professor

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Education

- 2005 Ph.D. (Chemistry)
Department of Chemistry, The University of Tokyo (Advisor: Prof. Eiichi Nakamura)
- 2002 M.Sc. (Chemistry)
Department of Chemistry, The University of Tokyo
- 2000 B.Sc. (Chemistry)
Department of Chemistry, The University of Tokyo

Professional Experience

- 2021.4–Present **Professor**
Graduate School of Pharmaceutical Sciences, Tohoku University
- 2016.9–2021.3 **Associate Professor (tenured)**
Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, Nanyang Technological University
- 2009.7–2016.8 **Assistant Professor**
Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, Nanyang Technological University
- 2009.7–2014.6 **Research Fellow**
Singapore National Research Foundation (NRF)
- 2005.2–2009.6 **Assistant Professor**
Department of Chemistry, The University of Tokyo
- 2002.4–2005.2 **JSPS Young Research Fellow**

Research Interests

Novel organic reaction chemistry toward efficient synthesis and new chemical spaces

Awards

- 2022 Mukaiyama Award
- 2020 Tokyo Chemical Industry (TCI)–Singapore National Institute of Chemistry (SNIC) Industry Award in Synthetic Chemistry
- 2015 Asian Core Program Lectureship (from Thailand)
- 2014 Chemical Society of Japan Award for Young Chemists
- 2014 Asian Core Program Lectureship (from China and Korea)
- 2011 Asian Core Program Lectureship (from Japan)
- 2011 Thieme Chemistry Journal Award
- 2007 Inoue Research Award for Young Scientists

Publications

Journal Publications and Preprints

162. Iwata, M.; Takami, Y.; Asanuma, H.; Hosono, K.; Ohno, H.; Yoshikai, N.; Kanemoto, K. A versatile entry to unnatural, disulfide-linked amino acids and peptides through the disulfuration of azlactones. *Chem. Sci.* **2025**, 10.1039/D4SC07187E.
161. Tsukiji, K.; Matsumoto, A.; Kanemoto, K.; Yoshikai, N. Stereoselective Hydroxyallylation of Cyclopropenes with Cyclopropanols via NHC Catalysis of Transient Organozinc Species. *Angew. Chem. Int. Ed.* **2024**, 63, e202412456.
160. Kikuchi, J.; Nagata, T.; Ito, S.; Yoshikai, N. Three-component Friedel–Crafts-type difunctionalization of ynamides with (hetero)arenes and iodine(III) electrophile. *Org. Chem. Front.* **2024**, 11, 3072-3079.
159. Kanemoto, K.; Yoshimura, K.; Ono, K.; Ding, W.; Ito, S.; Yoshikai, N. Amino- and Alkoxybenziodoxoles: Facile Preparation and Use as Arynophiles. *Chem. Eur. J.* **2024**, 30, e202400894.
158. Kikuchi, J.; Nakajima, R.; Yoshikai, N. Three-component N-alkenylation of azoles with alkynes and iodine(III) electrophile: synthesis of multisubstituted N-vinylazoles. *Beilstein J. Org. Chem.* **2024**, 20, 891-897.
157. Han, H.; Goh, G. W. Z.; Li, Y.; Yoshikai, N.; Ito, S. 1,3-Dipolar Cycloaddition of Polycyclic Aromatic Azomethine Ylides and Alkynylbenziodoxoles for Synthesis of Functional Dibenzoullazines. *Chin. J. Chem.* **2024**, 42, 1079-1083.
156. Arakawa, C.; Kanemoto, K.; Nakai, K.; Wang, C.; Morohashi, S.; Kwon, E.; Ito, S.; Yoshikai, N. Carboiodanation of Arynes: Organoiodine(III) Compounds as Nucleophilic Organometalloids. *J. Am. Chem. Soc.* **2024**, 146, 3910-3919.
155. Sasaki, S.; Kikuchi, J.; Ito, S.; Yoshikai, N. Stereoselective Approach to Multisubstituted Enolates from Unactivated Alkynes: Oxyalkylidenation of Alkynyl Ketone Enolates with Aldehydes. *J. Org. Chem.* **2023**, 88, 14096-14104.
154. Tsukiji, K.; Hayakawa, T.; Kanemoto, K.; Yoshikai, N. Zinc-Mediated Diastereoselective Annulation of Cyclopropanols with Alkylidenemalononitriles via Enolized Homoenate. *Asian J. Org. Chem.* **2023**, e202300114 [Prof. Keiji Maruoka's 70th birthday collection].
153. Saito, Y.; Kikuchi, J.; Wang, C.; Yoshikai, N. Site-Selective C–H Alkenylation of N-Heteroarenes by Ligand-Directed Co/Al and Co/Mg Cooperative Catalysis. *Angew. Chem. Int. Ed.* **2023**, 62, e202301006.
152. Yoshikai, N. Exploring New Reactions and Syntheses of Trivalent Iodine Compounds. *J. Synth. Org. Chem. Jpn.* **2022**, 80, 1011-1018.
151. Kikuchi, J.; Maesaki, K.; Sasaki, S.; Wang, W.; Ito, S.; Yoshikai, N. Stereoselective Synthesis of β -Alkoxy- β -amido Vinylbenziodoxoles via Iodo(III)etherification of Ynamides. *Org. Lett.* **2022**, 24, 6914-6918.
150. Tsukiji, K.; Sekiguchi, Y.; Kanemoto, K.; Yoshikai, N. Diastereoselective Conversion of Cyclopropanols to Cyclopentane-1,3-diols via Aldol Dimerization of Zinc Homo-enolates. *Chem. Lett.* **2022**, 51, 1012-1014.
149. Kikuchi, J.; Yoshikai, N. Cobalt Selectively Annulates. *Nat. Synth.* **2022**, 1, 674-675 (News & Views).
148. Wang, C.-S.; Yu, Y.; Sunada, Y.; Wang, C.; Yoshikai, N. Cobalt-Catalyzed Carbo- and Hydrocyanation of Alkynes via C–CN Bond Activation. *ACS Catal.* **2022**, 12, 4054-4066.
147. Sekiguchi, Y.; Yoshikai, N. Zinc-Mediated Hydroxyallylation of Aldehydes with Cyclopropanols: Direct Access to *anti-sec,tert*-Diols via Enolized Homoenate. *Org.*

- Letf.* **2022**, *24*, 960-965 (Preprint: Sekiguchi, Y.; Yoshikai, N. *ChemRxiv* **2021**, DOI: DOI 10.26434/chemrxiv-2021-swc95).
146. Chai, J.; Ding, W.; Wang, C.; Ito, S.; Wu, J.; Yoshikai, N. Ritter-Type Iodo(III)amidation of Unactivated Alkynes for the Stereoselective Synthesis of Multisubstituted Enamides. *Chem. Sci.* **2021**, *12*, 15128-15133 (Preprint: Chai, J.; Ding, W.; Ito, S.; Wu, J.; Yoshikai, N. *ChemRxiv* **2021**, DOI: 10.33774/chemrxiv-2021-c2ftp.).
145. Sekiguchi, Y.; Yoshikai, N. Zinc-Catalyzed β -Functionalization of Cyclopropanols via Enolized Homoenolate. *J. Am. Chem. Soc.* **2021**, *143*, 18400-18405 (Preprint: Sekiguchi, Y.; Yoshikai, N. *ChemRxiv* **2021**, DOI: 10.33774/chemrxiv-2021-4jlsp).
144. Sekiguchi, Y.; Lee, Y. Y.; Yoshikai, N. Nickel-Catalyzed Ring-Opening Allylation of Cyclopropanols via Homoenolate. *Org. Lett.* **2021**, *23*, 5993-5997.
143. Sekiguchi, Y.; Yoshikai, N. Enantioselective Conjugate Addition of Catalytically Generated Zinc Homoenolate. *J. Am. Chem. Soc.* **2021**, *143*, 4775-4781 (Preprint: Sekiguchi, Y.; Yoshikai, N. *ChemRxiv* **2021**, DOI: 10.26434/chemrxiv.13607438.v1).
142. Wang, C.-S.; Sun, Q.; Garcia, F.; Wang, C.; Yoshikai, N. Robust Cobalt Catalyst for Nitrile/Alkyne [2+2+2] Cycloaddition: Synthesis of Polyarylpyridines and Their Mechanochemical Cyclodehydrogenation to Nitrogen-Containing Polyaromatics. *Angew. Chem. Int. Ed.* **2021**, *60*, 9627-9634 (Preprint: Wang, C.-S.; Sun, Q.; Garcia, F.; Wang, C.; Yoshikai, N. *ChemRxiv* **2021**, DOI: 10.26434/chemrxiv.13465697.v1)
141. Laskar, R. A.; Ding, W.; Yoshikai, N. Iodo(III)-Meyer-Schuster Rearrangement of Propargylic Alcohols Promoted by Benziodoxole Triflate. *Org. Lett.* **2021**, *23*, 1113-1117.
140. Sekiguchi, Y.; Yoshikai, N. Metal-Catalyzed Transformations of Cyclopropanols via Homoenolates. *Bull. Chem. Soc. Jpn.* **2021**, *1*, 265-280.
139. Xu, W.; Wu, M.; Yoshikai, N. Iron-Catalyzed Remote C-H Alkylation of 8-Amidoquinolines with Cycloalkanes. *Synthesis* **2020**, *53*, 3144-3150.
138. Chai, J.; Ding, W.; Wu, J.; Yoshikai, N. Fluorobenziodoxole-BF₃ Reagent for Iodo(III)etherification of Alkynes in Ethereal Solvent. *Chem. Asian J.* **2020**, *15*, 2166-2169.
137. Ding, W.; Wang, C.; Tan, J. R.; Ho, C. C.; León, F.; García, F.; Yoshikai, N. Site-selective aromatic C-H λ^3 -iodination with cyclic iodine(III) electrophile in solution and solid phases. *Chem. Sci.* **2020**, *11*, 7356-7361.
136. Yang, J.; Mori, Y.; Yamanaka, M.; Yoshikai, N. Cobalt-Catalyzed Intramolecular Hydroacylation Involving Cyclopropane Cleavage. *Chem. Eur. J.* **2020**, *26*, 8302-8307.
135. Ding, W.; Chai, J.; Wang, C.; Wu, J.; Yoshikai, N. Stereoselective Access to Highly Substituted Vinyl Ethers via *trans*-Difunctionalization of Alkynes with Alcohols and Iodine(III) Electrophile. *J. Am. Chem. Soc.* **2020**, *142*, 8619-8624 (Preprint: Ding, W.; Chai, J.; Wu, J.; Yoshikai, N. *ChemRxiv* **2020**, DOI: 10.26434/chemrxiv.11770092.v1.)
134. Wang, C.-S.; Di Monaco, S.; Thai, A. N.; Rahman, M. S.; Pang, B. P.; Wang, C.; Yoshikai, N. Cobalt/Lewis Acid Catalysis for Hydrocarbofunctionalization of Alkynes via Cooperative C-H Activation. *J. Am. Chem. Soc.* **2020**, *142*, 12878-12889 (Preprint: *ChemRxiv* **2020**, DOI: 10.26434/chemrxiv.11760519.v1.)
133. Rahman, M. S.; Yoshikai, N. Synthesis of Triphenylene-Fused Phosphole Oxides via C-H Functionalizations. *Beilstein J. Org. Chem.* **2020**, *16*, 524-529.
132. Laskar, R. A.; Yoshikai, N. Cobalt-Catalyzed, N-H Imine-Directed Arene C-H Benzylolation with Benzyl Phosphates. *J. Org. Chem.* **2019**, *84*, 13172-13178.
131. Ding, W.; Ho, Y. K. T.; Okuda, Y.; Wijaya, C. K.; Tan, Z. H.; Yoshikai, N.

- Cobalt-Catalyzed Hydroacylative Dimerization of Allenes Leading to Skipped Dienes. *Org. Lett.* **2019**, *21*, 6173-6178.
130. Sun, Q.; Yoshikai, N. Cobalt-Catalyzed Tandem Radical Cyclization/C–C Coupling Initiated by Directed C–H Activation. *Org. Lett.* **2019**, *21*, 5238-5242.
129. Rahman, M. S.; Yoshikai, N. Synthesis and Properties of Phospha[5]helicenes Bearing Inner-Rim Phosphorus Center. *Org. Lett.* **2019**, *21*, 5238-5242.
128. Yang, J.; Sekiguchi, Y.; Yoshikai, N. Cobalt-Catalyzed Enantioselective and Chemodivergent Addition of Cyclopropanols to Oxabicyclic Alkenes. *ACS Catal.* **2019**, *9*, 5638-5644.
127. Wu, J.; Deng, X.; Yoshikai, N. Stereocontrolled Synthesis of Halovinylbenziodoxoles via Hydro- and Iodochlorination of Ethynylbenziodoxoles. *Chem. Eur. J.* **2019**, *25*, 7839-7842.
126. Xu, W.; Yoshikai, N. Iron-Catalyzed *ortho* C–H Arylation and Methylation of Pivalophenone N–H Imines. *ChemSusChem* **2019**, *12*, 3049-3053.
125. Yan, J.; Rahman, M. S.; Yoshikai, N. Pd-Catalyzed Annulation of 1-Halo-8-arylnaphthalenes and Alkynes Leading to Heptagon-Embedded Aromatic Systems, *Chem. Eur. J.* **2019**, *25*, 9395-9399.
124. Yang, J.; Sun, Q.; Yoshikai, N. Cobalt-Catalyzed Regio- and Diastereoselective Formal [3+2] Cycloaddition between Cyclopropanols and Allenes. *ACS Catal.* **2019**, *9*, 1973-1978.
123. Ding, W.; Yoshikai, N. Cobalt-Catalyzed Intermolecular [2+2] Cycloaddition between Alkynes and Allenes. *Angew. Chem. Int. Ed.* **2019**, *58*, 2500-2504.
122. Ding, W.; Ho, C. C.; Yoshikai, N. Photosensitized, Energy-Transfer-Mediated Cyclization of 2-(1-Arylvinyl)benzaldehydes to Anthracen-9-(10*H*)-ones. *Org. Lett.* **2019**, *21*, 1202-1206.
121. Yoshikai, N. Recent Advances in Enantioselective C–C Bond Formation via Organocobalt Species. *Synthesis* **2019**, *51*, 135-145.
120. Yang, J.; Shen, Y.; Lim, Y. J.; Yoshikai, N. Divergent ring-opening coupling between cyclopropanols and alkynes under cobalt catalysis. *Chem. Sci.* **2018**, *9*, 6928-6934.
119. Sun, Q.; Yoshikai, N. Cobalt-catalyzed directed *ortho*-methylation of arenes with methyl tosylate. *Org. Chem. Front.* **2018**, *7*, 2214-2218.
118. Wu, C.; Yoshikai, N. Cobalt-Catalyzed Intramolecular Reactions between a Vinylcyclopropane and an Alkyne: Switchable [5+2] Cycloaddition and Homo-Ene Pathways. *Angew. Chem. Int. Ed.* **2018**, *57*, 6558-6562.
117. Xu, W.; Pek, J. H.; Yoshikai, N. Iron-Catalyzed Directed C–H Silylation of Pivalophenone N–H Imines. *Asian J. Org. Chem.* **2018**, *14*, 1351-1354.
116. Xu, W.; Yoshikai, N. Cobalt-Catalyzed Directed C–H Alkenylation of Pivalophenone N–H Imine with Alkenyl Phosphates. *Beilstein J. Org. Chem.* **2018**, *14*, 709-715.
115. Sun, Q.; Yoshikai, N. Cobalt-Catalyzed C(sp²)–H/C(sp³)–H Coupling via Directed C–H Activation and 1,5-Hydrogen Atom Transfer. *Org. Chem. Front.* **2018**, *5*, 582-585.
114. Tan, W. W.; Wu, B.; Wei, Y.; Yoshikai, N. Copper and Secondary Amine-Catalyzed Pyridine Synthesis from O-Acetyl Oximes and α,β -Unsaturated Aldehydes. *Org. Synth.* **2018**, *95*, 1-14.
113. Xu, W.; Yoshikai, N. Cobalt-Catalyzed, N–H Imine-Directed Hydroarylation of Styrenes. *Org. Lett.* **2018**, *20*, 1392-1395.
112. Lee, P.-S.; Xu, W.; Yoshikai, N. Directed C–H Alkenylation of Aryl Imines with Alkenyl Phosphates Promoted by a Cobalt–N-Heterocyclic Carbene Catalyst. *Adv. Synth. Catal.* **2017**, *359*, 4340-4347 (Very Important Paper).

111. Yan, J.; Yoshikai, N. Phenanthrene Synthesis via Chromium-Catalyzed Annulation of 2-Biaryl Grignard Reagents and Alkynes. *Org. Lett.* **2017**, *19*, 6630-6633.
110. Wu, B.; Wu, J.; Yoshikai, N. Benziodoxole Triflate as a Versatile Reagent for Iodo(III)cyclization of Alkynes. *Chem. Asian J.* **2017**, *12*, 3123-3127.
109. Yoshikai, N. Iron-Catalyzed C–C Bond Formation via Chelation-Assisted C–H Activation. *Isr. J. Chem.* **2017**, *57*, 1117-1130.
108. Yan, J.; Yoshikai, N. Chromium-Catalyzed Migratory Arylmagnesiation of Unactivated Alkynes. *Org. Chem. Front.* **2017**, *4*, 1972-1975.
107. Xu, W.; Yoshikai, N. Pivalophenone Imine as a Benzonitrile Surrogate for Directed C–H Bond Functionalization. *Chem. Sci.* **2017**, *8*, 5299-5304.
106. Yoshikai, N.; Santra, M.; Wu, B. Synthesis of Donor-Acceptor-Type Benzo[*b*]phosphole and Naphtho[2,3-*b*]phosphole Oxides and Their Solvatochromic Properties. *Organometallics* **2017**, *20*, 1392-1395.
105. Tan, W. W.; Ong, Y. J.; Yoshikai, N. Synthesis of Highly Substituted Pyridines through Copper-Catalyzed Condensation of Oximes and α,β -Unsaturated Imines. *Angew. Chem. Int. Ed.* **2017**, *56*, 8240-8244.
104. Wu, B.; Melvina; Wu, X.; Yeow, E. K. L.; Yoshikai, N. Versatile Telluracyclic Synthesis via the Sequential Electrophilic Telluration of C(sp²)–Zn and C(sp²)–H Bonds. *Chem. Sci.* **2017**, *8*, 4527-4532.
103. Yang, J.; Rérat, A.; Lim, Y. J.; Gosmini, C.; Yoshikai, N. Cobalt-Catalyzed Enantio- and Diastereoselective Hydroacylation of Trisubstituted Alkenes. *Angew. Chem. Int. Ed.* **2017**, *56*, 2449-2453.
102. Wu, J.; Xu, K.; Hirao, H.; Yoshikai, N. Pd-Catalyzed, Ligand-Enabled Stereoselective 1,2-Iodine(III) Shift/1,1-Carboxyalkynylation of Alkynylbenziodoxoles. *Chem. Eur. J.* **2017**, *23*, 1521-1525.
101. Xu, W.; Yoshikai, N. N–H Imine as a Powerful Directing Group for Cobalt-Catalyzed Olefin Hydroarylation. *Angew. Chem. Int. Ed.* **2016**, *55*, 12731-12735.
100. Xu, W.; Pek, J. H.; Yoshikai, N. Cobalt-Catalyzed, Imine-Directed Olefin Hydroarylation under Grignard-Free Conditions. *Adv. Synth. Catal.* **2016**, *358*, 2564-2568.
99. Wu, J.; Deng, X.; Hirao, H.; Yoshikai, N. Pd-Catalyzed Conversion of Alkynyl- λ^3 -iodanes to Alkenyl- λ^3 -iodanes via Stereoselective 1,2-Iodine(III) Shift/1,1-Hydrocarboxylation. *J. Am. Chem. Soc.* **2016**, *138*, 9105-9108.
98. Tan, W. W.; Yoshikai, N. Copper-Catalyzed Coupling of 2-Siloxy-1-alkenes and Diazocarbonyl Compounds: Approach to Multisubstituted Furans, Pyrroles, and Thiophenes. *J. Org. Chem.* **2016**, *81*, 5566-5573.
97. Yan, J.; Yoshikai, N. Cobalt-Catalyzed Arylative Cyclization of Acetylenic Esters and Ketones with Arylzinc Reagents through 1,4-Cobalt Migration. *ACS Catal.* **2016**, *6*, 3738-3742.
96. Wu, B.; Yoshikai, N. Recent Developments in Synthetic Methods for Benzo[*b*]heteroles. *Org. Biomol. Chem.* **2016**, *14*, 5402-5416.
95. Yang, J.; Yoshikai, N. Cobalt-Catalyzed Annulation of Salicylaldehydes and Alkynes to Form Chromones and 4-Chromanones. *Angew. Chem. Int. Ed.* **2016**, *55*, 2870-2874.
94. Wu, J.; Yoshikai, N. Cobalt-Catalyzed Alkenylzincation of Unfunctionalized Alkynes. *Angew. Chem. Int. Ed.* **2016**, *55*, 336-340.
93. Wu, B.; Chopra, R.; Yoshikai, N. One-Pot Benzo[*b*]phosphole Synthesis through Sequential Alkyne Arylmagnesiation, Electrophilic Trapping, and Intramolecular

- Phospha-Friedel–Crafts Cyclization. *Org. Lett.* **2015**, *17*, 5666-5669.
92. Wu, J.; Yoshikai, N. Modular Synthesis of Multisubstituted Furans through Palladium-Catalyzed Three-Component Condensation of Alkynylbenziodoxoles, Carboxylic Acids, and Imines. *Angew. Chem. Int. Ed.* **2015**, *54*, 11107-11111.
91. Xu, W.; Paira, R.; Yoshikai, N. Ortho-C–H Benzoylation of Aryl Imines with Benzyl Phosphates under Cobalt–Pyphos Catalysis. *Org. Lett.* **2015**, *17*, 4192-4195.
90. Tan, W. W.; Yoshikai, N. Copper-Catalyzed Condensation of Imines and α -Diazo- β -dicarbonyl Compounds: Modular and Regiocontrolled Synthesis of Multisubstituted Pyrroles. *Chem. Sci.* **2015**, *6*, 6448-6455.
89. Wu, B.; Yoshikai, N. Conversion of 2-Iodobiaryls into 2,2-Diodobiaryls via Oxidation-Iodination Sequences: A Versatile Route to Ladder-Type Heterofluorenes. *Angew. Chem. Int. Ed.* **2015**, *54*, 8736-8739.
88. Yang, J.; Seto, Y. W.; Yoshikai, N. Cobalt-Catalyzed Intermolecular Hydroacylation of Olefins through Chelation-Assisted Imidoyl C–H Activation. *ACS Catal.* **2015**, *5*, 3054-3057.
87. Yoshikai, N. Cp*Co^{III}-Catalyzed C–H Activation of (Hetero)arenes: Expanding the Scope of Base-Metal-Catalyzed C–H Functionalization. *ChemCatChem* **2015**, *7*, 732-734. (one of most accessed articles in Feb 2015)
86. Wong, M. Y.; Yamakawa, T.; Yoshikai, N. Iron-Catalyzed Directed C2-Alkylation and Alkenylation of Indole with Vinylarenes and Alkynes. *Org. Lett.* **2015**, *17*, 442-445.
85. Lee, P.-S.; Yoshikai, N. Cobalt-Catalyzed Enantioselective Directed C–H Alkylation of Indoles with Styrenes. *Org. Lett.* **2015**, *17*, 22-25.
84. Yamakawa, T.; Seto, Y. W.; Yoshikai, N. Cobalt-Catalyzed Directed Alkylation of Olefinic C–H Bond with Primary and Secondary Alkyl Chlorides. *Synlett* **2015**, *26*, 340-344.
83. Xu, W.; Yoshikai, N. Highly Linear-Selective Cobalt-Catalyzed Addition of Aryl Imines to Styrenes: Reversing Intrinsic Regioselectivity by Ligand Elaboration. *Angew. Chem. Int. Ed.* **2014**, *53*, 14166-14170.
82. Yang, J.; Yoshikai, N. Cobalt-Catalyzed Enantioselective Intramolecular Hydroacylation of Ketones and Olefins. *J. Am. Chem. Soc.* **2014**, *136*, 16748-16751. [one of most accessed articles in Nov 2014]
81. Yoshikai, N. Cobalt-Catalyzed C–C Bond-Forming Reactions via Chelation-Assisted C–H Activation. *J. Synth. Org. Chem. Jpn.* **2014**, *72*, 1198-1206.
80. Tan, W. W.; Hou, X.; Yoshikai, N. Pd(II)/Bu₄NBr/DMSO Catalytic System for Practical Synthesis of Indoles and Pyrroles from Imines through Aerobic Dehydrogenative Cyclization. *Synthesis* **2014**, *46*, 2727-2733.
79. Lu, B.; Wu, J.; Yoshikai, N. Palladium-Catalyzed Condensation of N-Aryl Imines and Alkynylbenziodoxolones To Form Multisubstituted Furans. *J. Am. Chem. Soc.* **2014**, *136*, 11598-11601.
78. Yoshikai, N. Development of Cobalt-Catalyzed C–H Bond Functionalization Reactions. *Bull. Chem. Soc. Jpn.* **2014**, *87*, 843-857.
77. Karthikeyan, J.; Yoshikai, N. Rhodium(III)-Catalyzed Directed peri-C–H Alkenylation of Anthracene Derivatives. *Org. Lett.* **2014**, *16*, 4224-4227.
76. Gao, K.; Yamakawa, T.; Yoshikai, N. Cobalt-Catalyzed Chelation-Assisted Alkylation of Arenes with Primary and Secondary Alkyl Halides. *Synthesis* **2014**, *46*, 2024-2039 (Feature Article).
75. Wu, B.; Santra, M.; Yoshikai, N. A Highly Modular One-Pot Multicomponent Approach to Functionalized Benzo[*b*]phosphole Derivative, *Angew. Chem. Int. Ed.*

- 2014**, 53, 7543-7546. [Highlighted in *Synfacts* **2014**, 10, 928]
74. Tan, B.-H.; Yoshikai, N. Cobalt-Catalyzed Addition of Arylzinc Reagents to Norbornene Derivatives through 1,4-Cobalt Migration. *Org. Lett.* **2014**, 16, 3392-3395.
73. Asako, S.; Norinder, J.; Ilies, L.; Yoshikai, N.; Nakamura, E. ortho-Allylation of 1-Arylpyrazole with Allyl Phenyl Ether via Iron-Catalyzed C–H Bond Activation under Mild Conditions. *Adv. Synth. Catal.* **2014**, 356, 1481-1485.
72. Gao, K.; Paira, R.; Yoshikai, N. Cobalt-Catalyzed Ortho-C–H Alkylation of 2-Arylpyridines via Ring-Opening of Aziridines. *Adv. Synth. Catal.* **2014**, 356, 1486-1490.
71. Yoshikai, N.; Gao, K. Cobalt-Catalyzed Directed Alkylation of Arenes with Primary and Secondary Alkyl Halides. *Pure Appl. Chem.* **2014**, 86, 419-424.
70. Yamakawa, T.; Yoshikai, N. Alkene Isomerization–Hydroarylation Tandem Catalysis: Indole C2-Alkylation with Aryl-Substituted Alkenes Leading to 1,1-Diaryllkanes. *Chem. Asian J.* **2014**, 9, 1242-1246.
69. Gao, K.; Yoshikai, N. Low-Valent Cobalt Catalysis: New Opportunities for C–H Functionalization. *Acc. Chem. Res.* **2014**, 47, 1208-1219.
68. Rijs, N. J.; Yoshikai, N.; Nakamura, E.; O'Hair, R. A. J. Unraveling Organocuprate Complexity: Fundamental Insights into Intrinsic Group Transfer Selectivity in Alkylation Reactions. *J. Org. Chem.* **2014**, 79, 1320-1334.
67. Harano, K.; Takenaga, S.; Okada, S.; Niimi, Y.; Yoshikai, N.; Isobe, H.; Suenaga, K.; Kataura, H.; Koshino, M.; Nakamura, E. Conformational Analysis of Single Perfluoroalkyl Chains by Single-Molecule Real-Time Transmission Electron Microscopic Imaging. *J. Am. Chem. Soc.* **2014**, 136, 466-473.
66. Wu, B.; Yoshikai, N. Versatile Synthesis of Benzothiophenes and Benzoselenophenes by Rapid Assembly of Arylzinc Reagents, Alkynes, and Elemental Chalcogens. *Angew. Chem. Int. Ed.* **2013**, 52, 10496-10499.
65. Deb, I.; Yoshikai, N. Phenanthridine Synthesis through Iron-Catalyzed Intramolecular N-Arylation of O-acetyl Oxime, *Org. Lett.* **2013**, 15, 4254-4257.
64. Ding, Z.; Yoshikai, N. Cobalt-Catalyzed Intramolecular Olefin Hydroarylation Leading to Dihydropyrroloindoles and Tetrahydropyrroloindoles. *Angew. Chem. Int. Ed.* **2013**, 52, 8574-8578.
63. Dong, J.; Lee, P.-S.; Yoshikai, N. Cobalt-Catalyzed Branched-Selective Addition of Aromatic Ketimines to Styrenes under Room Temperature Conditions. *Chem. Lett.* **2013**, 42, 1140-1142.
62. Gao, K.; Yoshikai, N. Cobalt-Catalyzed Ortho Alkylation of Aromatic Imines with Primary and Secondary Alkyl Halides. *J. Am. Chem. Soc.* **2013**, 135, 9279-9282.
61. Chen, Z.; Lu, B.; Ding, Z.; Gao, K.; Yoshikai, N. α -Palladation of Imines as Entry to Dehydrogenative Heck Reaction: Aerobic Oxidative Cyclization of *N*-Allylimines to Pyrroles. *Org. Lett.* **2013**, 15, 1966-1969.
60. Yoshikai, N.; Wei, Y. Synthesis of Pyrroles, Indoles, and Carbazoles through Transition Metal-Catalyzed C–H Functionalization. *Asian J. Org. Chem.* **2013**, 2, 466-478.
59. Yamakawa, T.; Yoshikai, N. Cobalt-Catalyzed *ortho*-Alkenylation of Aromatic Aldimines via Chelation-Assisted C–H Bond Activation. *Tetrahedron* **2013**, 69, 4459-4465.
58. Wei, Y.; Yoshikai, N. Modular Pyridine Synthesis from Oximes and Enals through Synergistic Copper/Iminium Catalysis. *J. Am. Chem. Soc.* **2013**, 135, 3756-3759.

57. Yamakawa, T.; Yoshikai, N. Annulation of α,β -Unsaturated Imines and Alkynes via Cobalt-Catalyzed Olefinic C–H Activation. *Org. Lett.* **2013**, *15*, 196-199.
56. Lee, P.-S.; Yoshikai, N. Aldimine-Directed Branched-Selective Hydroarylation of Styrenes. *Angew. Chem. Int. Ed.* **2013**, *52*, 1240-1244.
55. Hajra, A.; Wei, Y.; Yoshikai, N. Palladium-Catalyzed Aerobic Dehydrogenative Aromatization of Cyclohexanone Imines to Arylamines. *Org. Lett.* **2012**, *14*, 5488-5491.
54. Ilies, L.; Matsumoto, A.; Kobayashi, M.; Yoshikai, N.; Nakamura, E. Synthesis of Polysubstituted Naphthalenes by Iron-Catalyzed [2+2+2] Annulation of Grignard Reagents with Alkynes. *Synlett* **2012**, 2381-2384.
53. Tan, B.-H.; Dong, J.; Yoshikai, N. Cobalt-Catalyzed Addition of Arylzinc Reagents to Alkynes to Form *ortho*-Alkenylarylzinc Species through 1,4-Cobalt Migration. *Angew. Chem. Int. Ed.* **2012**, *51*, 9610-9614.
52. Ding, Z.; Yoshikai, N. C2-Alkylation of N-Pyrimidylindole with Vinylsilanes via Cobalt-Catalyzed C-H Bond Activation. *Beilstein J. Org. Chem.* **2012**, *8*, 1536-1542.
51. Gao, K.; Lee, P.-S.; Long, C.; Yoshikai, N. Cobalt-Catalyzed *Ortho*-Arylation of Aromatic Imines with Aryl Chlorides. *Org. Lett.* **2012**, *14*, 4234-4237.
50. Nakamura, Y.; Yoshikai, N.; Ilies, L.; Nakamura, E. Nickel-Catalyzed Monosubstitution of Polyfluoroarenes with Organozinc Reagents Using Alkoxydiphosphine Ligand. *Org. Lett.* **2012**, *14*, 3316-3319.
49. Adak, L.; Yoshikai, N. Iron-Catalyzed Annulation Reaction of Arylindium Reagents and Alkynes to Produce Substituted Naphthalenes. *Tetrahedron* **2012**, *68*, 5167-5171.
48. Wei, Y.; Deb, I.; Yoshikai, N. Palladium-Catalyzed Aerobic Oxidative Cyclization of *N*-Aryl Imines: Indole Synthesis from Anilines and Ketones. *J. Am. Chem. Soc.* **2012**, *134*, 9098-9101.
47. Ding, Z.; Yoshikai, N. Mild and Efficient C2-Alkenylation of Indoles with Alkynes Catalyzed by a Cobalt Complex. *Angew. Chem. Int. Ed.* **2012**, 4698-4701.
46. Gao, K.; Yoshikai, N. Cobalt-Catalyzed Arylation of Aldimines via Directed C–H Bond Functionalization: Addition of 2-Arylpyridines and Self-Coupling of Aromatic Aldimines. *Chem. Commun.* **2012**, *48*, 4305-4307.
45. Yoshikai, N.; Nakamura, E. Mechanisms of Nucleophilic Organocopper(I) Reactions. *Chem. Rev.* **2012**, *112*, 2339-2372.
44. Ilies, L.; Kobayashi, M.; Matsumoto, A.; Yoshikai, N.; Nakamura, E. Iron-Catalyzed Nitrogen-Directed Coupling of Arene and Aryl Bromides Mediated by Metallic Magnesium. *Adv. Synth. Catal.* **2012**, *354*, 593-596.
43. Rijs, N.; Yoshikai, N.; Nakamura, E.; O'Hair, R. A. J. Gas-Phase Reactivity of Group 11 Dimethylmetallates with Allyl Iodide. *J. Am. Chem. Soc.* **2012**, *134*, 2569-2580.
42. Yoshikai, N.; Asako, S.; Yamakawa, T.; Ilies, L.; Nakamura, E. Iron-Catalyzed C–H Bond Activation for the *ortho*-Arylation of Aryl Pyridines and Imines with Grignard Reagents. *Chem. Asian. J.* **2011**, *6*, 3059-3065.
41. Lee, P.-S.; Fujita, T.; Yoshikai, N. Cobalt-Catalyzed, Room-Temperature Addition of Aromatic Imines to Alkynes via Directed C–H Bond Activation. *J. Am. Chem. Soc.* **2011**, *133*, 17283-17295.
40. Wei, Y.; Yoshikai, N. Oxidative Cyclization of 2-Arylphenols to Dibenzofurans under Pd(II)/Peroxybenzoate Catalysis. *Org. Lett.* **2011**, *13*, 5504-5507.
39. Adak, L.; Yoshikai, N. Cobalt-Catalyzed Preparation of Arylindium Reagents from Aryl and Heteroaryl Bromides. *J. Org. Chem.* **2011**, *76*, 7563-7568.

38. Gao, K.; Yoshikai, N. Cobalt–Phenanthroline Catalysts for the ortho Alkylation of Aromatic Imines under Mild Conditions. *Angew. Chem. Int. Ed.* **2011**, *50*, 6888-6892.
37. Ding, Z.; Yoshikai, N. Cobalt-Catalyzed Alkenylation of Thiazoles with Alkynes via C–H Bond Functionalization. *Synthesis* **2011**, 2561-2566.
36. Chen, Q.; Ilies, L.; Yoshikai, N.; Nakamura, E. Cobalt-Catalyzed Coupling of Alkyl Grignard Reagent with Benzamide and 2-Phenylpyridine Derivatives through Directed C–H Bond Activation under Air. *Org. Lett.* **2011**, *13*, 3232-3234.
35. Yoshikai, N. Cobalt-Catalyzed, Chelation-Assisted C-H Bond Functionalization. *Synlett* **2011**, 1047-1051. * Invited highlight article
34. Jin, M.-Y.; Yoshikai, N. Cobalt–Xantphos Catalyzed, LiCl-Mediated Preparation of Arylzinc Reagents from Aryl Iodides, Bromides, and Chlorides. *J. Org. Chem.* **2011**, *76*, 1972-1978 (Featured Article).
33. Gao, K.; Yoshikai, N. Regioselectivity-Switchable Hydroarylation of Styrenes. *J. Am. Chem. Soc.* **2011**, *133*, 400-402.
32. Adak, L.; Chan, W. C.; Yoshikai, N. Nickel-Catalyzed, Directing Group-Assisted [2 + 2 + 2] Cycloaddition of Imine and Alkynes. *Chem. Asian. J.* **2011**, *6*, 359-362.
31. Ding, Z.; Yoshikai, N. Cobalt-Catalyzed Addition of Azoles to Alkynes. *Org. Lett.* **2010**, *12*, 4180-4183.
30. Gao, K.; Lee, P.-S.; Fujita, T.; Yoshikai, N. Cobalt-Catalyzed Hydroarylation of Alkynes through Chelation-Assisted C-H Bond Activation. *J. Am. Chem. Soc.* **2010**, *132*, 12249-12251.
29. Nakamura, E.; Yoshikai, N. Low-Valent Iron-Catalyzed C–C Bond Formation—Addition, Substitution, and C–H Bond Activation. *J. Org. Chem.* **2010**, *75*, 6061-6067.
28. Ilies, L.; Okabe, J.; Yoshikai, N.; Nakamura, E. Iron-Catalyzed, Directed Oxidative Arylation of Olefins with Organozinc and Grignard Reagents. *Org. Lett.* **2010**, *12*, 2838-2840.
27. Gärtner, T.; Yoshikai, N.; Neumeier, M.; Nakamura, E.; Gschwind, R. M. Ligand Exchange Reactions in Cu(III) Complexes: Mechanistic Insights by Combined NMR and DFT Studies. *Chem. Commun.* **2010**, *46*, 4625-4626.
26. Yoshikai, N.; Mieczkowski, A.; Matsumoto, A.; Ilies, L.; Nakamura, E. Iron-Catalyzed C-C Bond Formation at α -Position of Aliphatic Amines via C-H Bond Activation through 1,5-Hydrogen Transfer. *J. Am. Chem. Soc.* **2010**, *132*, 5568-5569.
25. Yoshikai, N.; Matsumoto, A.; Norinder, J.; Nakamura, E. Iron-Catalyzed Direct Arylation of Aryl Pyridines and Imines Using Oxygen as an Oxidant. *Synlett* **2010**, 313-316.
24. Yoshikai, N.; Matsuda, H.; Nakamura, E. Hydroxyphosphine Ligand for Nickel-Catalyzed Cross-Coupling through Nickel/Magnesium Bimetallic Cooperation. *J. Am. Chem. Soc.* **2009**, *131*, 9590-9599.
23. Yoshikai, N.; Miura, K.; Nakamura, E. Enantioselective Copper-Catalyzed Allylic Substitution with Aminohydroxyphosphine Ligand. *Adv. Synth. Catal.* **2009**, *351*, 1014-1018.
22. Yoshikai, N.; Matsumoto, A.; Norinder, J.; Nakamura, E. Iron-Catalyzed Chemoselective ortho Arylation of Aryl Imines by Directed C-H Bond Activation. *Angew. Chem. Int. Ed.* **2009**, *48*, 2925-2928.
21. Yoshikai, N.; Zhang, S.-L.; Yamagata, K.-i.; Tsuji, H.; Nakamura, E. Mechanistic Study of the Manganese-Catalyzed [2 + 2 + 2] Annulation of 1,3-Dicarbonyl Compounds and Terminal Alkynes. *J. Am. Chem. Soc.* **2009**, *131*, 4099-4109.
20. Yoshikai, N.; Matsuda, H.; Nakamura, E. Ligand Exchange as the First Irreversible

- Step in the Nickel-Catalyzed Cross-Coupling Reaction of Grignard Reagents. *J. Am. Chem. Soc.* **2008**, *130*, 15258-15259.
19. Yoshikai, N.; Zhang, S.-L.; Nakamura, E. Origin of the Regio- and Stereoselectivity of Allylic Substitution of Organocopper Reagents. *J. Am. Chem. Soc.* **2008**, *130*, 12862-12863.
 18. Norinder, J.; Matsumoto, A.; Yoshikai, N.; Nakamura, E. Iron-Catalyzed Direct Arylation through Directed C-H Bond Activation. *J. Am. Chem. Soc.* **2008**, *130*, 5858-5859.
 17. Yoshikai, N.; Iida, R.; Nakamura, E. Mechanism of Nucleophilic Substitution of Acyl Electrophiles using Lithium Organocuprates. *Adv. Synth. Catal.* **2008**, *350*, 1063-1072.
 16. Hajra, A.; Yoshikai, N.; Nakamura, E. Aminohydroxyphosphine Ligands for Copper-Catalyzed Enantioselective Conjugate Addition of Organozinc Reagents. *Org. Lett.* **2006**, *8*, 4153-4155.
 15. Yoshikai, N.; Yamanaka, M.; Ojima, I.; Morokuma, K.; Nakamura, E. Bimetallic Synergism in Alkyne Silylformylation Catalyzed by Cobalt-Rhodium Mixed-Metal Cluster. *Organometallics* **2006**, *25*, 3867-3875.
 14. Yoshikai, N.; Yamashita, T.; Nakamura, E. Mechanism of Remote Conjugate Addition of a Lithium Organocuprate to Polyconjugated Carbonyl Compounds. *Chem. Asian. J.* **2006**, *1*, 322-330.
 13. Norinder, J.; Bäckvall, J.-E.; Yoshikai, N.; Nakamura, E. Unusual Homo-Coupling in the Reaction of Diorganocuprates with an Allylic Halide. *Organometallics* **2006**, *25*, 2129-2132.
 12. Yoshikai, N.; Mashima, H.; Nakamura, E. Nickel-Catalyzed Cross-Coupling Reaction of Aryl Fluorides and Chlorides with Grignard Reagents under Nickel/Magnesium Bimetallic Cooperation. *J. Am. Chem. Soc.* **2005**, *127*, 17978-17979.
 11. Yoshikai, N.; Yamashita, T.; Nakamura, E. Mechanism of Remote Conjugate Addition of a Lithium Organocuprate to a Polyconjugated Carbonyl Compound. *Angew. Chem. Int. Ed.* **2005**, *44*, 4721-4723.
 10. Ammal, S. C.; Yoshikai, N.; Inada, Y.; Nishibayashi, Y.; Nakamura, E. Synergistic Dimetallic Effects in Propargylic Substitution Reaction Catalyzed by Thiolate-Bridged Diruthenium Complex. *J. Am. Chem. Soc.* **2005**, *127*, 9428-9438.
 9. Kinoshita, N.; Marx, K. H.; Tanaka, K.; Tsubaki, K.; Kawabata, T.; Yoshikai, N.; Nakamura, E. Enantioselective Allylic Substitution of Cinnamyl Esters Catalyzed by Iridium-Chiral Aryl Phosphite Complex: Conspicuous Change in the Mechanistic Spectrum by a Counter Cation and Solvent. *J. Org. Chem.* **2004**, *69*, 7960-7964.
 8. Yoshikai, N.; Ammal, S. C.; Nakamura, E. L-shaped Three-center Two-electron (C-C-C)⁺ Bonding Array. *J. Am. Chem. Soc.* **2004**, *126*, 12941-12948.
 7. Yoshikai, N.; Nakamura, E. Mechanism of Substitution Reaction on sp²-Carbon Center with Lithium Organocuprate. *J. Am. Chem. Soc.* **2004**, *126*, 12264-12265.
 6. Nakamura, E.; Yoshikai, N. On the Mechanism of Higher-Order Cuprate, Alias Lipshutz Cuprate. *Bull. Chem. Soc. Jpn.* **2004**, *77*, 1-12.
 5. Yoshikai, N.; Nakamura, E. Theoretical Studies on Diastereo- and Enantioselective Rhodium-Catalyzed Cyclization of Diazo Compound via Intramolecular C-H Bond Insertion. *Adv. Synth. Catal.* **2003**, *345*, 1159-1171.
 4. Nakamura, E.; Yoshikai, N.; Yamanaka, M. Mechanism of C-H Bond Activation/C-C Bond Formation Reaction between Diazo Compound and Alkane Catalyzed by Dirhodium Tetracarboxylate. *J. Am. Chem. Soc.* **2002**, *124*, 7181-7192.

3. Nakamura, M.; Yoshikai, N.; Nakamura, E. Carbozincation of Dipolar Trimethylenemethane. A New Route to Functionalized Organozinc Reagents. *Chem. Lett.* **2002**, 146-147.
2. Nakamura, M.; Yoshikai, N.; Toganoh, M.; Nakamura, E. [3 + 3] Cycloaddition of Dipolar Trimethylenemethane with Active Methylene Compound. *Synlett* **2001**, 1030-1033.
1. Nakamura, E.; Yamanaka, M.; Yoshikai, N.; Mori, S. Kinetic Reactivity of Higher Order Cuprate in S_N2 Alkylation Reaction. *Angew. Chem. Int. Ed.* **2001**, 40, 1935-1938.

Book Chapters

11. Science of Synthesis Base-Metal Catalysis, Vol. 2, Yoshikai, N. Ed.; Thieme; Stuttgart, 2023.
10. Science of Synthesis Base-Metal Catalysis, Vol. 1, Yoshikai, N. Ed.; Thieme; Stuttgart, 2022.
9. Organocobalt Complexes in C–H Activation, Yoshikai, N. In *Comprehensive Organometallic Chemistry IV*, Mayer, K.; O'Hare, D.; Parkin, G. Eds., Elsevier, 2022.
8. Cobalt-Catalyzed Asymmetric C–H Functionalization, Yoshikai, N. In *Handbook of C–H Functionalization*, Maiti, D. Ed., Wiley, 2022.
7. Cobalt-Catalyzed C–H Activation, Yoshikai, N. In *Chemistry of Organocobalt Compounds*, Gosmini, C.; Marek, I. Eds., Wiley, 2022.
6. Benzo[*b*]thiophenes, Yoshikai, N.; Rayner, C. M.; Graham, M. A. In *Science of Synthesis Knowledge Updates*, (2020) **2**, 53 (DOI: 10.1055/sos-SD-110-01749).
5. Cobalt-Catalysed C–H Functionalization, Yoshikai, N. In *Cobalt Catalysis in Organic Synthesis: Methods and Reactions*, Hapke, M.; Hilt, G. Eds., Wiley, 2020.
4. Hydroarylation of Alkynes and Alkenes using Group 7–9 First Row Transition Metal Catalysts, Yoshikai, N. In *Catalytic Hydroarylation of Carbon-Carbon Multiple Bonds*, Ackermann, L.; Gunnoe, T. B.; Habgood, L. G. Eds., Wiley, 2018.
3. Heterocycle Synthesis via Co-Catalyzed C–H Activation/Functionalization, Yoshikai, N. In *Transition Metal-Catalyzed Heterocycle Synthesis via C–H Activation*, Wu, X.-F. Ed., Wiley, 2016.
2. Iron-Catalyzed C–C Bond Formation with C–H Bond Activation, Yoshikai, N. In *Chemistry of Organoiron Compounds*, Rappoport, Z.; Marek, I. Eds., Wiley, 2014.
1. Theory of Organocopper-Mediated Reactions, Nakamura, E.; Yoshikai, N. In *Chemistry of Organocopper Compounds*, Rappoport, Z.; Marek, I. Eds., Wiley, 2009.