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Atom-economical and sustainable C-N bond formation reactions from alcohols and N-sources via catalytic hydrogen transfer reactions

Soon Hyeok Hong
Seoul National University, South Korea

Development of useful, practical, and selective synthetic methods that generate minimal by-product is of critical importance in both academic and industrial research. The research of our group seeks to develop practical and environmentally friendly synthetic methodology using transition metal catalysts. Specifically, we have explored novel C–N formation reactions from primary alcohols and various N-sources, chemical synthesis using CO2 and methanol as C1 sources, and development of organometallic catalysts based on N-heterocyclic carbene ligands. Direct C–N formation reactions from alcohols and N-containing molecules is a highly atom economical transformation producing hydrogen as the sole byproduct. Well-defined N-heterocyclic carbene based Ru complexes were developed as highly active pre catalysts based on the mechanistic insight suggesting a Ru hydride species as an active catalytic intermediate. With the developed catalysts, various novel C–N formation reactions for the synthesis of amides, imides, ureas, and amines were achieved. The developed catalytic systems involving hydrogen transfer have been also applied to CO2 reduction and methanol activation. With these sustainable C1 sources, reactions developments are actively ongoing in our group. Lastly, our recent researches on homogeneous catalyst development based on N-heterocyclic carbene and pincer ligands will be presented.

Biography

Soon Hyeok Hong obtained his PhD in 2007 at the California Institute of Technology, under the guidance of Professor Robert H Grubbs. After having Postdoctoral research experience at the University of California, Los Angeles and industrial experiences at Materia, Inc., he began his independent career in academia as an Assistant Professor at Nanyang Technological University with a joint appointment as a National Research Foundation Fellow of the Singapore government in 2008. In 2011, he moved back to his undergraduate school, Seoul National University, where he has been working on green organo metallic catalysis in developing efficient, practical, and sustainable synthetic methods.

soonhong@snu.ac.kr

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