Editorial: N-Heterocyclic Carbenes

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Happy new year from To Chemistry! As we enter 2019 it appears pertinent not only to look forward to the New Year, but also to consider on our achievements in 2018 which is, of course, the journal's birth year, has been a very successful year for the journal.

N-heterocyclic carbenes (NHCs) have been known for the last fifty years. However, this is already a mature field but since last two decades this particular field is rapidly developing with exhilarating results which will continue to show its significance to community in the coming years. In the past two decades, NHCs have attracted much enthusiastic advancements in catalytic organic transformations as ligands in transition-metal catalysis by employing in a broad range of organic reactions in organometallic chemistry such as in C-C and C-N bond forming cross coupling reactions, synthesis of organoflourine compounds, hydrosilylation, benzoin condensation, amination, Stetter reaction, redox reaction of functional aldehydes, homoenolate transformations, click chemistry, cycloaddition of ketenes, C-H activation and oligomerization of olefins. All these transformations are based on the Lewis basic properties of NHCs. Nevertheless, transformations (except transesterification and Michael additions) based on the Brønsted basic properties of NHCs are still far less investigated. (DOI: 10.1039/c7ob00599g) In particular, numerous research efforts have been explored by taking NHC as ligand with various transition metals like Pd, Fe, Ni, Cu, Ir, Ru, Ag, Au etc. for numerous transformations. Apart from this, the potential of N-heterocyclic carbene complexes have also been reported in biomedical applications like antimicrobial and anticancer properties. Particularly, in case of challenging cross-coupling reactions, computational studies suggest strong σ-donation to the metal center and variable steric bulk around the metal center which impart stability to the complex and facilitate the oxidative addition and reductive elimination steps in the catalytic cycle.

A paper contribution by Guo at el. displayed NHC-catalyzed C–S bond formation reactions which provided new methods for the manufacture of this versatile unit. (DOI: 10.1016/j.catcom.2017.02.007) Begum et al. synthesized a well-defined I mmobilized palladium complex from a bis-NHC functionalized with chloropropyltriethoxysilane over silica. (DOI: 10.1039/c6dt03097a) Liu et al. synthesized 1,10-phenanthroline based NHC palladium (II) complexes employing it as catalysts for Suzuki-Miyaura cross-coupling reaction. (DOI: 10.1016/j.tetlet.2016.12.071). Li et al. reported a Pd-PEPPSI catalyzed Suzuki-Miyaura cross-coupling of aryl esters via selective C–O cleavage using water at room temperature. (DOI:10.1002/adsc.201701563). Tian et al. reported three bulky (Pd(NHC)(acac)Cl) catalyst which showed much better catalytic activity in the Buchwald-Hartwig arylamination coupling reaction as compared to the earlier congener (IPr*)Pd(acac)Cl. (DOI: 10.1016/j.jorganchem.2018.02.035) Li et al. reported a Pd-PEPPSI catalyzed Suzuki-Miyaura cross-coupling of aryl esters via selective C−O cleavage at room temperature. Wang et al. reported the synthesis of dinuclear NHC–palladium(II) complex. (DOI:10.1007/s11243-018-0224-6) Recently, Domyati et al. described the synthesis of a cationic Cu-pincer bis (NHC) complex with bulky tert-butyl wingtips that serves as catalyst for Sonoghasira coupling. (DOI: 10.1016/j.jorganchem.2018.02.028) Finally, a paper contribution by Delany et al. described the use of novel NHC ligands bearing a bulky yet highly electron-deficient N-aryl substituent for the first highly chemoselective intermolecular benzoin condensations between two non-identical aromatic aldehydes. (DOI:10.1039/c7ob03005c). In this particular area, recently, I provided a comprehensive review on the development of recent advances in the N-heterocyclic carbenes (NHCs) as ligands in the cross-coupling reactions. This comprehensive review fills a void in the literature with highlighting the diverse aspects of synthesis and catalytic applications of transition-metal complexes of NHCs with in the fields of catalytic applications. It is clear from this collection of articles that the research in this particular area is flourishing. It is hoped that this article will motivate researchers to contribute to the future advancement of this interesting research area.

Finally, I would like to take this opportunity to show gratitude all of the authors, referees, and Editorial Board members for their immense efforts and contributions in making this issue valuable reading for all who are fascinated in the recent advancements in the various arena of chemistry. I anticipate that the readers will definitely enjoy the contributor's work published in this issue as much as we have. Finally, I wish you a happy and wonderful 2019.