

Simple cobalt-based catalytic systems for functionalisation of organic molecules

Cross-coupling reactions are a valuable tool widely used in the field of organic synthesis, including syntheses of everyday use compounds, such as pharmaceuticals. The most often used catalysts of this reactions are based on palladium – an expensive noble metal. Its high price and critical geopolitical threats to its supply chain make scientists search for new catalysts based on non-noble metals, such as iron, nickel, and cobalt. This last metal is gaining increasing interest because of its unique properties, however, as for now, its use in cross-coupling reactions is limited. Cobalt has also other properties making it useful in different processes, such as C-H and N-H bond activation. This project aims at expanding the usefulness of cobalt catalysis in cross coupling and C-H / N-H activation processes by development of new catalytic systems and understanding mechanisms underlying their action.

Research tasks to be undertaken in the project comprise synthesis of cobalt coordination compounds, screening of their activity in cross-coupling and C-H / N-H activation reactions, and optimisation of selected catalytic systems. The best of catalysts will be used to synthesise extended range of organic compounds in order to show their usefulness. Other potentially useful processes aided by cobalt complexes identified during the research will be also explored, and the mechanisms of devised transformations will be studied.

Although the use of non-noble metal catalysis is in line with the *Green Chemistry* rules, most contemporary catalytic systems uses high amounts of cobalt halides and valuable ligands (reaching 10%), which defies the idea of sustainability. Development of new stable (pre)catalysts optimised for specific reactions will be a return to the aforementioned ideas.

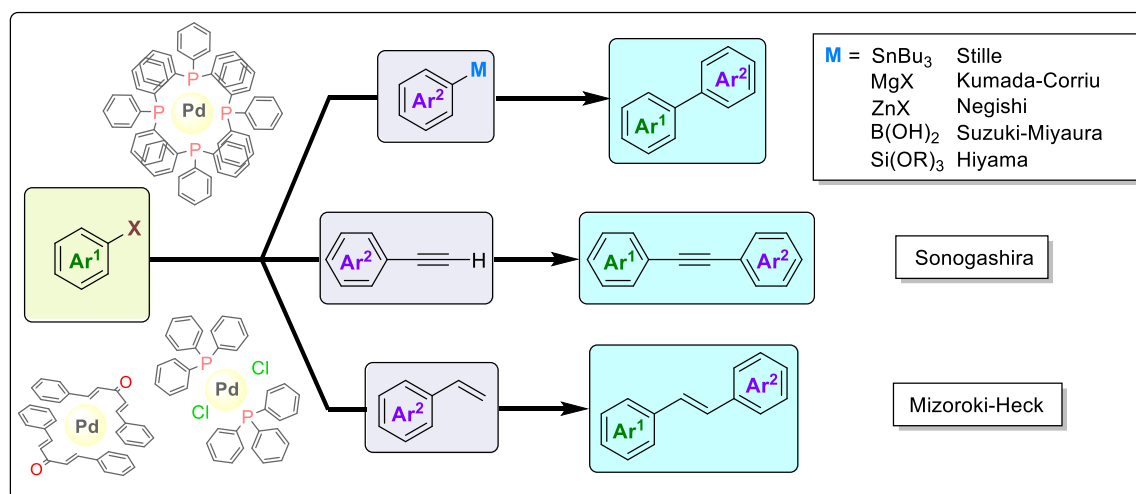


Fig. 1. Variety of palladium-catalysed cross-coupling reactions named after their discoverers.