Editorial

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Welcome to this themed issue on non-noble metals in catalysis

Dear CHIMIA readers

Transition metal catalysts are formidable tools towards greener chemistry, allowing for low-waste, energy-efficient, and selective reactions. However, the noble metals (Ru, Os, Rh, Ir, Pd, Pt) that are currently most common in homogeneous catalysts suffer from high toxicity and environmental impact in addition to their scarcity and ensuing high cost. Some of these drawbacks are effectively mitigated by ultra-high catalytic efficiencies such as outstanding turnover numbers and frequencies, or by establishing efficient recycling strategies. Another promising approach is the use of first-row (non-noble) metals such as Mn, Fe, Co, Ni, and Cu. These Earth-abundant metals have been emerging as environmentally benign alternatives, but to this day they rarely equal the performance of their noble counterparts. The often lower catalytic performance has been associated to numerous factors, including among others the propensity of the non-noble metals to undergo one-electron transformations while bond making and breaking processes are typically two-electron events. Moreover, the substitutional lability of first-row transition metals exacerbates a control of their coordination geometry and ligand binding, both essential aspects for catalyst development.

In an effort to better understand and progress the catalytic application of first row metals, an international training network on non-noble metal catalysis, *NoNoMeCat*, has been established, which has been offering structured interdisciplinary training to a generation of young researchers in the field of homogeneous catalysis with Earth-abundant metals with the aim to push the boundaries of the field in terms of catalyst stability, selectivity, mechanistic understanding, and scalability, which included active participation from both academia and industry. For example, some of the newly developed catalysts were used for novel oxidative transformations in current Syngenta projects.

This issue collates some of the approaches to address these challenges. Specifically, it features progress in enhancing the catalytic activity with manganese (contributions from Ye and Costas), with iron (contributions from Klein Gebbink, Harvey, Schollhammer, Ye, and Costas), with cobalt (Ye), and with nickel (Hu, Moret, Klein Gebbink, and Albrecht). The reactivities are very diverse and range from the reduction of CO_2, carbonyl, and olefin to selective C–H bond oxidation and cross-coupling, including both experimental and computational approaches.

We hope that you will enjoy the diversity of the work at display in this issue and that the articles will inspire you to apply Earth-abundant and non-noble metals in catalytic transformations and stimulate further developments in this area as a contribution to advance more sustainable processes.

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The Editorial Board of CHIMIA is very grateful to the guest editors Prof. Klein Gebbink and Prof. Albrecht for organizing this special issue on Non-Noble Metals in Catalysis providing the readership with an interesting insight into the research being undertaken in the *NoNoMeCat* international network.