

Iron catalysed atom transfer radical addition reactions

Sara H. Kyne

School of Chemistry, University of Lincoln, United Kingdom

skyne@lincoln.ac.uk

Catalytic bond forming reactions are powerful and versatile tools for modern synthetic chemistry which have worldwide importance for ecological and sustainable chemistry. Our research aims to develop environmentally benign and efficient catalytic methods through an improved understanding of the mechanisms of these reactions.

For example, traditional free radical reactions were mediated by trialkyltin hydrides or precursors, and it is now necessary to develop lower toxicity alternatives. Transition metal complexes with low oxidation states are particularly suitable substitutes owing to their ability to undergo single electron transfer.

Two iron catalysed atom transfer radical addition reactions will be described as exemplars (Figure 1). Organometallic iron(II) complexes promote Ueno-Stork reactions and electrochemical studies and Mössbauer spectroscopy have established that the ligand bound to the metal centre plays a crucial role in the structure and reactivity of the catalytically active anionic iron(I) species.^[1,2] Iron(0) nanoparticles are readily synthesised *in situ*, and electron microscopy techniques have facilitated optimisation of catalyst design and formation, thus improving halogen atom transfer reaction efficiency.

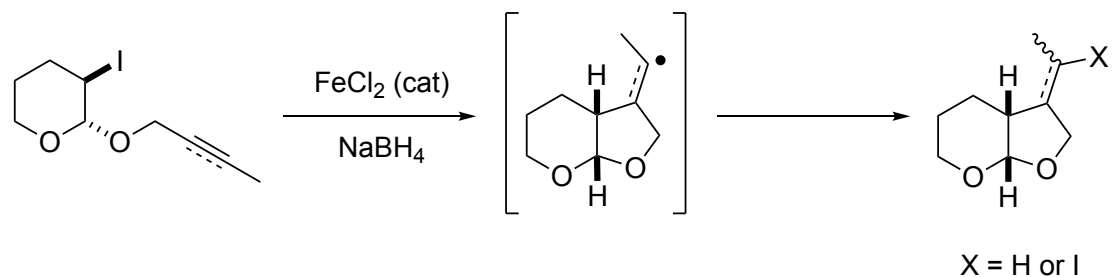


Figure 1: Iron catalysed atom transfer radical addition reactions.

Further work aims to use the mechanistic understanding to expand the scope and utility of these methodologies.

References.

- [1] S. H. Kyne, C. Lévêque, S. Zheng, L. Fensterbank, A. Jutand, C. Ollivier, *Tetrahedron* **2016**, *72*, 7727–7737.
- [2] S. H. Kyne, M. Clémancey, G. Blondin, E. Derat, L. Fensterbank, A. Jutand, G. Lefèvre, C. Ollivier, *Organometallics* **2017**, 10.1021/acs.organomet.7b00603.