

Exploring the Combination of Electrochemistry, Fluorination and Hypervalent Iodine for the Development of Novel Organic Methodology

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The incorporation of fluorine into bioactive molecules is a well-established tool used by medicinal chemistry for improving metabolic stability, biocompatibility and potency, which are all essential for the discovery of new lifesaving pharmaceuticals and selective agrochemicals. Thus, the continual development of new reactions that are more selective, sustainable and scalable is of high importance.

Over the past several years, we have established a research programme that exploits the use of electrochemistry and hypervalent iodine to mediate novel selective reactions. We have developed reductive defluorination pathways, as well as oxidative C–H functionalization, alkene and alkyne functionalization reactions. For example, by exploiting the innate reactivity of the fluoride anion and combining it with electrochemical anodic oxidation, inexpensive and sustainable processes can be realised. With this approach, we have developed several different synthetic methods, which are not possible by other means and through which we have enabled access to new areas of chemical space. Interesting building blocks can be created using a transition metal-catalysed approach.

In this talk, I will describe the development and scope of several different reactions, and will focus heavily on our mechanistic understanding of how they operate by describing our experimental and theoretical investigations.

