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MINI-REVIEW ARTICLE

Applications of Selectfluor in Organic Synthesis-A Quadrennial Update

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Abstract: Selectfluor, bis(tetrafluoroborate)[1-chloromethyl-4-fluoro-1,4-diazoniabicyclo-[2.2.2] octane] is an extraordinarily stable solid with exceptional properties, such as strong solubility and stability in polar solvents, minimal toxicity, excellent thermal stability, and utility as an oxidant. One of the electrophilic fluorinating compounds that is most frequently employed in fluorination reactions is Selectfluor. In this mini-review, we have briefly updated the various applications of Selectfluor in organic synthesis, particularly in C-C, C-heteroatom and heteroatom-heteroatom bond formation reactions from mid-2020 to date. In addition to these, Selectfluor found useful in heterocyclic ring formations, demethylation, deoxygenation and other miscellaneous reactions. The results that have been published thus far show how extraordinarily promising Selectfluor-mediated organic molecule skeleton assembly events can be. Visible light, electrochemical, and nano-based reactions still have a lot of room for growth and application, despite the noteworthy advances in these domains. The compilation is subdivided based on the type of reaction/function of Selectfluor organic transformation.

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Keywords: Selectfluor, oxidation, C-C and C-hetero bond formations, hetero-hetero bond formations, organic transformations, polar solvents.

1. INTRODUCTION

Selectfluor, [1-chloromethyl-4-fluoro-1,4-diazoniabicyclo-[2.2.2] octane bis(tetrafluoroborate)] is an incredibly stable solid with outstanding characteristics (Fig. **1**), including low toxicity, strong solubility and stability in polar solvents (MeCN, DMF, H_2O, and MeOH), great thermal stability (up to 195°C), and usefulness as an oxidant (SCE = 0.33 V) [1, 2]. Selectfluor is one of the most extensively used electrophilic fluorinating chemicals in fluorination reactions. Furthermore, Selectfluor has shown useful in both commercial and scientific settings as a "fluorine-free" functional reagent for organic transformations [3].

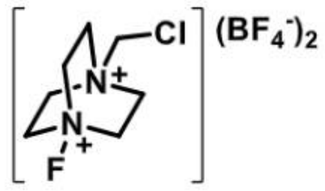

Fig. (1). Structure of Selectflour.

In 2011, the Stavber group demonstrated that selectfluor could act as an oxidant or Lewis's acid in various organic reactions such as selective oxidations, transition metal-catalyzed cross-couplings, condensation reactions, regioselective ring-opening, Diels-Alder cycloadditions, carbene transfer reactions, and other organic transformations hitherto [4]. In 2017, Zhu and co-workers introduced a powerful Au/Selectfluor catalytic system for the activation of π-bonds in tandem Diels-Alder/Diels-Alder and carbene-transfer reactions [5]. Research groups of Gómez-Suárez [6], Yang [7], and Weng [8] independently reviewed the applications of selectfluor in organic synthesis until mid-2020. Selectfluor is a derivative of the nucleophillic base DABCO. Very recently, we have reviewed the applications of DABCO in organic synthesis [9]. In continuation of our interest in exploring the applications of versatile reagents in organic synthesis and catalysis [10-26], the current quadrennial update (from mid-2020 to the present), classified by the type of reactions/function, briefly outlines the research progress of Selectfluor in organic synthesis.

2. APPLICATIONS OF SELECTFLUOR IN ORGANIC SYNTHESIS

2.1. Demethylenation of Epoxides

The epoxy group has been indispensable to the contemporary practice of synthetic organic chemistry for many years, surpassing all other important functional groups. Its ring opening and formation have produced groundbreaking discoveries and beneficial synthetic techniques [27]. Lectka *et al.* investigated a novel reactivity pattern about ring opening, which entails demethylenation after a rare radical-based C-C bond cleavage of epoxides **1** [28]. Working together, Selectfluor and its radical dication-Selectfluor derived radical dication (SRD)-achieve the reaction; a mechanism involving the production and identification of a crucial reactive intermediate is postulated and validated by experiment and DFT calculations. For 1,1-disubstituted epoxides, the reaction appears to be somewhat ubiquitous (Scheme **1**).

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