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REVIEW ARTICLE

Recent Advances in Hypervalent Iodine Reagents and *m*-CPBA Mediated Oxidative Transformations

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Abstract: Among the several peroxides available, *meta*-chloroperbenzoic acid (*m*CPBA) plays an efficient role of oxidizing reagent and is used for many oxidative transformations, such as oxidation of various functional groups, carbon-carbon, carbon-hetero bond formation, heterocyclic ring formation, heteroarylation, oxidative cross-coupling, lactonization, oxidative dearomatization, α-oxytosylation or α-acetoxylation, oxidative C-C bond activation and in other miscellaneous reactions. The purpose of this review is to critically discuss the significant contributions of *m*CPBA along with hypervalent iodine/iodine reagents in organic synthesis from mid-2015 to date.

Ravi Varala

Keywords: *m*-CPBA, hypervalent iodine reagents, oxidation, organic transformations, catalysis, organic synthesis.

1. INTRODUCTION

One of the most significant transformations carried out on a regular basis in synthetic organic chemistry is oxidation, which finds extensive application in the synthesis of agrochemicals, pharmaceuticals, and their intermediates [1-10]. On the other hand, oxidation ranks among the most challenging procedures in terms of environmental friendliness, operational simplicity, and safety. Due to their extreme reactivity and often harsh reaction conditions, oxidants are not suitable for use in large-scale synthesis protocols. This is likely the reason for the surge in recent years in basic research publications and new patents pertaining to these fundamental transformations.

Research labs employ organic peroxides extensively because of their great reactivity and oxidative potential. Under mild conditions, organic peracids are a flexible reagent that can oxidize a wide range of functional groups. Several oxidative reactions use the strong oxidizing substance *meta*-chloroperbenzoic acid (*m*CPBA) (**1**, Fig. **1**) [11-18].

The melting point of *meta*-chloroperoxybenzoic acid is 90°C. Since its pure form is combustible when exposed to shock or sparks, it is kept in a combination that contains less than 72% *m*CPBA (*meta*-chlorobenzoic acid and water). *m*CPBA is typically preferred over other peroxy acids due to its improved ease of handling. Before safer storage and transportation occur, thermal instability and dynamics must be understood [19]. *m*CPBA is a widely available, low-cost oxidant that readily oxidizes a wide spectrum of functional groups. Because of its non-symmetrical O-O bond, which is heterolytically broken during the oxidation cycle, it is a great donor of a single oxygen atom. One smart application of

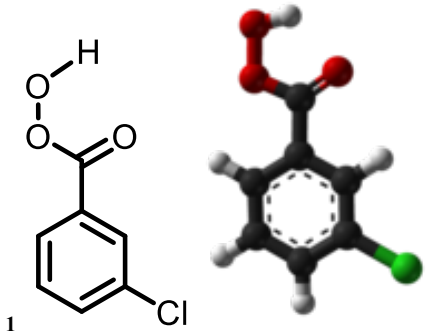

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Fig. (1). Molecular structure of *m*-chloroperoxybenzoic acid. *(A higher resolution / colour version of this figure is available in the electronic copy of the article).*

*m*CPBA in synthetic designs is to swap out complex organic conversions for quicker ones. In many reactions, *m*CPBA is more selective than hydrogen peroxide and other peracids due to its high reactivity. Terent'ev and colleagues have gathered a number of organic peroxide rearrangements and associated processes [20]. Hussain and colleagues thoroughly examined *m*CPBA use in organic synthesis til 2014 [21]. Merkushev followed it up with an emphasis on *m*CPBA in 2015 [22]. In continuation of our interest in exploring redox reagents [23-31], the current octennial update critically summarizes the most significant achievements in the chemistry of *m*CPBA along with hypervalent iodine/iodine reagent-mediated oxidative transformations from 2015 to the present, with the intention of encouraging the development of novel, more promising synthetic applications in the near future.

2. AS OXIDANT ALONG WITH HYPERVALENT IODINE/IODINE REAGENTS

In synthetic chemistry, oxidative reactions are common. As a result, it is not surprising to see ongoing efforts to uncover and

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