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REVIEW ARTICLE

Recent Advances in Di-*tert*-butyl Peroxide (DTBP)-Promoted C-C Bond Formation Reactions

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Abstract: Di-*tert*-butyl peroxide is a commonly used organoperoxide in many oxidation transformations. The primary factors contributing to the increasing usefulness of DTBP include its affordability, eco-friendliness, exceptional efficacy, and capacity to substitute harmful or rare heavy metal oxidants. In this decennial update, we thoroughly examined noteworthy C-C bond formation reactions promoted by DTBP from 2014 till the present. This review centers on the benefits and drawbacks of synthetic organic transformations using DTBP, as well as their extent and underlying mechanisms.

Keywords: Di-*tert*-butyl peroxide (DTBP), oxidation, C-H functionalization, C-C bond formation, radical reactions, oxidation transformations.

1. INTRODUCTION

It has been said that C-H functionalization is the ultimate objective in synthetic organic chemistry [1]. Recent advances in organic chemistry, organometallics, and catalysis have significantly improved our knowledge of the reactivity of C-H bonds and the development of strong reactions that make use of this expertise [2]. By expanding the number of sites that can be addressed in a given molecule, novel approaches for C-H activation increase the possibility of elaborating it into a more complex product. Furthermore, it permits the targeting of entirely distinct types of chemical bonds in organic synthesis, especially concerning strong chemoselectivity [3]. C-H functionalization greatly simplifies chemical synthesis to produce complicated natural products and medicinal molecules when combined with conventional functional-group chemistry [4]. In terms of step economy and waste reduction, it is advantageous to convert a C-H into a C-C, C-N, C-O, or C-X bond in a selective and controlled manner with consistency and predictability. The carbon-carbon (C-C) bond forms the 'backbone' of nearly every organic molecule and lies at the heart of the chemical sciences. It represents a basic transformation in synthetic organic chemistry. In pharmaceutical chemistry, agrochemical, and natural product synthesis, the ability to develop and expand a carbon framework through a sequence of C-C bond-forming events is significant [5].

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The emergence of stoichiometric reagents, which serve to place a specific carbon-containing moiety, improved and robust cross-coupling protocols, and increased accessibility to a variety of organometallic reagents have all contributed to tremendous advancements in the synthetic methods available for C-C bond formation [6-9].

This review is aimed at offering an up-to-date development on the design of carbon-carbon bond-forming protocols to access a wide variety of organic molecules of topical significance mediated by one of the powerful C-C bond-forming reagents *via* oxidation, di-*tert*-butyl peroxide (DTBP). DTBP is an organic molecule composed of a peroxide group linked to two *tert*-butyl groups. Because of the large *tert*-butyl groups, it is one of the most stable organic peroxides. At temperatures higher than 100°C, the colorless liquid experiences homolysis. Because of this, di-*tert*-butyl peroxide is frequently employed in polymer chemistry and chemical synthesis as a radical initiator [10]. Since DTBP serves as fuel and the oxidizer in an engine, it is theoretically possible to use it in engines with limited oxygen supply [11-13].

2. APPLICATIONS OF DTBP IN C-C BOND FORMATIONS

The key factors contributing to the rising usefulness of DTBP are its low cost, environmental friendliness, high efficiency, and ability to replace hazardous or uncommon heavy metal oxidants. As of right now, the literature on the applications of DTBP in C-H functionalization with a special focus on C-C bond formations has not been thoroughly and criti-

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