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REVIEW

Visible Light-Mediated Synthesis of Quinazoline and Quinazolinone Derivatives: A Quadrennial Update

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ABSTRACT

Quinazoline and quinazolinones are among the most significant nitrogenous heterocycles in medicinal chemistry, with a broad range of biological properties. There are several traditional methods to generate them in the literature. Most of them include the generation of enormous amounts of waste, laborious workup, and poor-yield products, all of which contribute to the impact on the environment. Therefore, it would be ideal to employ moderate, straightforward methods to construct such a strong nucleus. However, during the past fifteen years, visible light-mediated transformations have also garnered a lot of interest as an environmentally friendlier and greener alternative since they use photons as a clean energy source. This study investigates a range of representative synthetic protocols from 2021 forward to date, therefore expanding our understanding of visible light-driven quinazoline and quinazolinone derivative synthesis. It also generates ideas for potential future developments. This compendium is organized based on the type of heterocyclic scaffold that was synthesized. The scopes, limits, and mechanistic research of various study findings are also discussed.

1 | Introduction

Heterocyclic compounds have garnered significant research attention due to their numerous important biological and medicinal applications [1, 2]. They are present in over 90% of new medications and bridge the gap between chemistry and biology, which is where a great deal of scientific advancement and use takes place [3–5]. Although nitrogen, oxygen, and sulfur are the most prevalent heteroatoms, heterocyclic rings containing other heteroatoms, such as phosphorus, iron, magnesium, selenium, etc., are also often found. Because of their wide range of uses, heterocyclic compounds containing nitrogen are essential in medicinal chemistry [6–8].

Quinazoline and quinazolinones are among the most significant nitrogeneous heterocycles in medicinal chemistry, with a variety of biological characteristics such as analgesic, antibacterial, antifungal, anticonvulsant, anti-inflammatory, anti-HIV, anticancer, and antifungal effects [9–18]. The main distinction between the three nitrogen-containing heterocyclic compounds—quinazoline, quinazolinone, and quinoxaline—is found in their structures (Figure 1): quinazoline is the base molecule,

Abbreviations: CNCT, Graphitic carbon nitride; DFT, Density functional theory; EDA, Electron donor-acceptor; EDG, Electron donating group; EWG, Electron withdrawing group; EY, Eosin Y; FDA, The Food and Drug Administration; HAT, Hydrogen atom transfer; LED, Light emitting diode; LPO, Lauroyl peroxide; $(MC)_2R$, The multicomponent-multicatalyst reaction; MS, Mass spectrometry; PC, Photocatalyst; PET, Photoinduced energy transfer; RB, Rose Bengal; SET, Single electron transfer; TBHP, *tert*-Butyl hydroperoxide; TEMPO, 2,2,6,6-Tetramethylpiperidinyl 1-oxyl; TFA, Trifluoroacetic acid; TFAA, Trifluoroacetic anhydride; TMEDA, *N, N, N′, N′*-tetramethylethane-1,2-diamine.