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Visible light-promoted synthesis of 3-selanylthiochromenones

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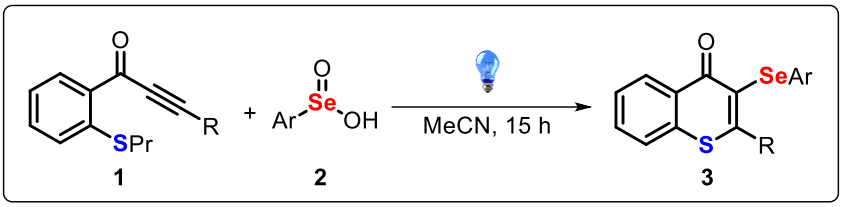
ABSTRACT

Principle #6 of Green Chemistry underscores the necessity of energy-efficient designs in chemical processes to reduce economic and environmental impacts. To achieve this, the chemical industry must explore alternative, efficient energy sources and develop synthetic procedures operable at room temperature and pressure.[1] Technologies like electromagnetic irradiation (microwave, UV, visible light), sonochemistry, and mechanochemistry have been crucial over the past decades, facilitating valuable chemical transformations. Visible light photocatalysis has seen a significant surge since the early 21st century. Advances in this area have sparked interest in transformations through direct excitation of substrate-derived species or transition metal complexes by visible light, without photosensitizers, greatly impacting organic synthesis by providing innovative solutions and new reactivity forms.[2]

Thiochromenones, important in natural products, drug candidates, and biologically active molecules, belong to the flavones family and feature a benzo-fused thiopyranone core.[3] Meanwhile, the critical roles of selenoenzymes like glutathione peroxidase (GPx) and thioredoxin reductase (TrxR) in protecting against reactive oxygen species (ROS) have spurred interest in organoselenium compounds. This interest has led to the discovery of selenium-containing and selenium-functionalized heterocycles with potent activity against various pathologies, making them promising candidates for new bioactive compounds. Among organoselenium reagents, benzeneseleninic acid (BSA) derivatives stand out due to their stability, lack of odor, and ease of handling, offering a sophisticated alternative for producing Se(II)-containing products from Se(IV)-based electrophilic species.[4]

A visible light-mediated protocol was developed for the construction of 3-selanyllthiochromenones by a radical annulation of ortho-thioaryl ynones. The reaction is triggered by a sulfur-centered radical, which is formed through the light excitation of an intramolecular electron donor-acceptor complex (EDA-complex). The reactions were conducted under open-air conditions, not requiring metal catalysts, oxidant species, or heating, making this a mild and environmentally friendly approach to access valuable compounds.



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