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Visible-Light-Mediated Cyclization of 1,3-Diones and Chalcogenoalkynes: A New Regioselective Method for Polysubstituted Chalcogenofurans

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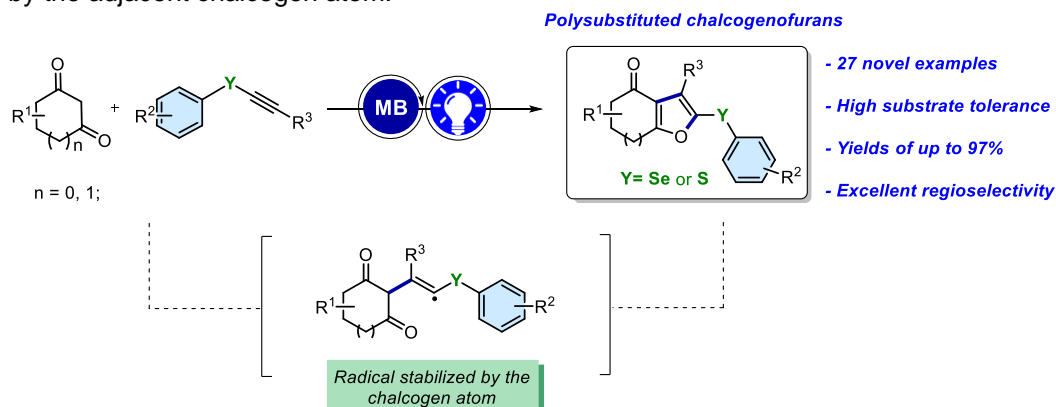
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ABSTRACT

The use of visible light as a mediator in chemical reactions represents a significant advance in energy efficiency.¹ This technique facilitates the activation of various substrates and the formation of new bonds under mild conditions, enabling the synthesis of valuable molecules.² Our research focuses on the synthesis of polysubstituted chalcogenofurans, which show considerable potential for diverse applications. The synthetic approach involves an oxidative cycloaddition reaction between 1,3-diones and chalcogenoalkynes. Blue LEDs served as the light source, methylene blue as the photocatalyst, and (NH₄)₂S₂O₈ as the oxidizing agent, all at room temperature for six hours. This method demonstrated remarkable versatility, applicable to various chalcogenoalkynes and 1,3-diones, yielding 27 chalcogenofurans with yields ranging from 67% to 97% and exhibiting excellent regioselectivity. Mechanistic studies revealed that a radical forms at the α -dicarbonyl carbon of the 1,3-dione, which then reacts with the chalcogenoalkyne to produce an olefinic intermediate stabilized by the adjacent chalcogen atom.



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