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A mild and efficient procedure for alkenols oxyselenocyclization by using ionic liquids

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Abstract

A mild and efficient procedure for the oxyselenocyclization of unsaturated alcohols by treatment with phenylselenenyl chloride using ionic liquids as solvents/catalyzers has been developed. The reaction proceeds instantaneously under mild conditions with absolute regioselectivity, using primary, secondary, tertiary, and aromatic alcohols, as well as monosubstituted, disubstituted, and trisubstituted alkenols. This procedure provides a new method for the synthesis of substituted tetrahydrofurans and tetrahydropyrans ethers, the precursors of many biologically active metabolites, avoiding the use of toxic and corrosive catalysts. There are no previous reports of selenium-mediated cyclofunctionalization reactions in ionic liquids. Taking into the account the good results obtained with [MMIM][MSO₄], its ease preparation, low viscosity, low price, and its capacity to be recovered and reused, it was selected as the solvent/catalyzer. Quantum-chemical calculations (MP2(fc)/6-311 + G**//B3LYP/6-311 + G**) has shown that the intramolecular cyclization is promoted by the hydrogen bond formed between the ionic liquid anion and the hydroxyl group of the alkenol.

KEYWORDS

catalysis, ionic liquids, oxyselenocyclization, quantum-chemical calculations, sustainable chemistry

1 | INTRODUCTION

Selenium is a fundamental element in life sciences; it can be found in many active and natural compounds such as carbohydrates, amino acids, and peptides.^[1] Due to their biological and pharmacological properties, organoselenium compounds have emerged as important therapeutic compounds, acting as antioxidant,^[2,3] anti-

inflammatory, antitumor,^[4] antimicrobial, or antiviral agents.^[1,5] During the last decades, organoselenium compounds have also appeared as important reagents and intermediates in organic synthesis.^[6,7] They can participate in a wide number of reactions, usually under relatively mild conditions^[8] and presenting chemo-, regio-, or stereo-selectivity.^[9] Thus, organoselenium compounds have been widely employed as intermediates in the