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## **Unsymmetrical Selenide Ethers Synthesis Starting from Benzyl Selenocyanates as Masked Selenols. Chemical/Photochemical Preparative, Electrochemical, Computational, and Mechanistic Study**

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Since the last century, organoselenium compounds have emerged as a valuable building block in organic synthesis demonstrating their importance in modern synthetic chemistry. They proved to be versatile reagents that can be employed as radicals, electrophiles, and nucleophiles for the formation of several chemical bonds.

As a general trend, diorganoyl diselenides have been used as the starting material to obtain unsymmetrical selenides, as it has been recently reviewed by Braga *et al* through photochemical transformations, and by novel synthetic strategy under transition metal-free conditions. However, the obtention of diselenides is not an easy task, several methods have been described, such as the simple oxidation of stinky selenols. In addition, alkyl and aryl selenols can be obtained from the insertion of elemental selenium into Grignard or organolithium reagents. These compounds can also be obtained by the in-situ generated  $\text{Se}^{2-}$  since selenium powder gives self-disproportionation under extremely basic conditions and high temperatures. This methodology is not compatible with substituents sensitive to a strong reducer or basic conditions. Selenium reduction by hydrazine appeared as a very simple and functional group's tolerant methodology; however, the use of such a very toxic reagent like hydrazine is a drawback in this procedure.

Thus, herein we present the reduction of substituted benzyl selenocyanates ( $\text{RC}_6\text{H}_4\text{CH}_2\text{SeCN}$ ) as masked selenols by means of photo-redox catalysis or Rongalite reduction to give the corresponding diselenides. Additionally, a simple methodology was developed employing the in-situ generated benzyl selenolate anion ( $\text{PhCH}_2\text{Se}^-$ ) to promote aliphatic nucleophilic substitution, epoxide ring-opening, and Michael addition reactions; or submitted to photolysis to obtain unsymmetrical selenide ethers in the presence of electron-rich arenes. The visible blue light is used to promote the reaction avoiding transition metal complexes. Additives such as strong oxidants or bases were not required. Moreover, EtOH or MeCN was employed as a benign solvent under mild reaction conditions. In addition, electrochemical study and computational calculations were done to give us a better insight into the reductive reaction mechanism.

Even though many synthetic strategies have been reported for the synthesis of diselenide and unsymmetric selenide compounds, we felt that the exploration of simple and sustainable protocols in continuous flow would represent an important advance in organoselenium chemistry. In this sense, these reactions were also performed and evaluated in continuous Flow systems.