

## RESEARCH ARTICLE

# Microwave-assisted Cobalt-copper Dual Catalyzed Ligand Free C-Se Cross-coupling

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**Abstract: Background:** Organoselenides are important building blocks of several biologically important molecules and natural products. Several protocols have been developed by chemists for their synthesis. Transition metal-catalyzed cross-coupling is a powerful tool for this purpose in the last two decades. Various transition metal catalysts e.g. Pd, Ni, Cu, In etc. have been used for performing C-Se cross-coupling in the presence or absence of ligands.

**Objective:** Development of a sustainable protocol for transition metal-catalyzed C-Se cross-coupling is the main objective of this research. Recently, Cobalt has been applied as a cheap and sustainable transition metal catalyst in several organic reactions. This protocol is focused on applying cobalt salt as a catalyst for performing C-Se cross-coupling for the first time.

**Method:** Co(acac)<sub>2</sub> has been successfully employed for performing Se-arylations in the presence of CuI, which acts as a co-catalyst under microwave irradiation. NMP was used as solvent and KOH as a reductant in this reaction.

**Results:** Both iodo- and bromoarenes have been used to perform C-Se cross-coupling with diaryl diselenide under this Co/Cu dual catalytic system. The reaction was successful with both electron-donating and withdrawing groups in *ortho*-, *meta*-, and *para*-positions in the aromatic ring of Bromo and iodoarenes.

**Conclusion:** This is an effective protocol for the preparation of organoselenides, catalyzed by cobalt in the presence of copper. The mechanism has been established by several experimental techniques.

**Keywords:** Cobalt, copper, cross-coupling, organoselenides, green chemistry, dual catalysis.

## 1. INTRODUCTION

Organoselenides are important building blocks found as core units in several biologically active molecules, drugs, medicines, natural products, etc. (Fig. 1) [1, 2]. They are often found as intermediates in several organic reactions [3]. They are also important therapeutic leads due to their antioxidant and antibacterial activities [4]. Thus, the synthesis of organoselenides is an important reaction in organic chemistry. Thus, several protocols have been reported till now for the synthesis of diaryl selenides. Among them, the reaction of diaryl diselenides with iodoarenes is the most explored reaction for this purpose. Several metal catalysts like Pd [5], Fe [6], Ni [7], Cu [8] have been applied to perform the synthesis of diaryl selenides by this reaction in presence or

absence of ligands under different conditions. Metal nanoparticles have also been applied for performing Se-arylations [9].

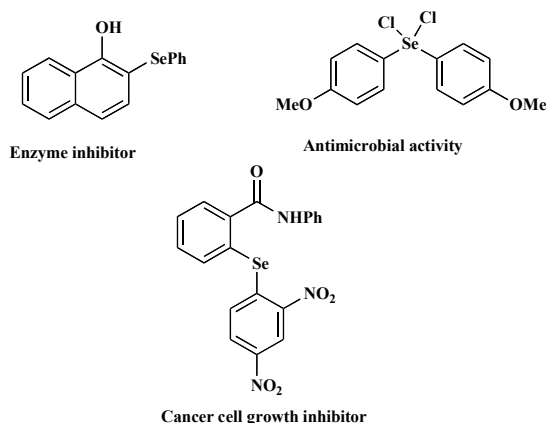


Fig. (1). Biologically important organoselenides.

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