An Efficient Synthesis of Alkynyl Selenides and Telurides from Terminal Acetylenes and Diorganoyl Dichalcogenides Catalyzed by Copper Oxide Nanopowder

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INTRODUCTION

Alkynyl chalcogenides are interesting class of compounds having a variety of uses in organic synthesis. Especially, alkynylselenides and alkynyl telurides have been used as useful precursors in hydroamination, hydrosulfonation and hydroboration reactions.[1]

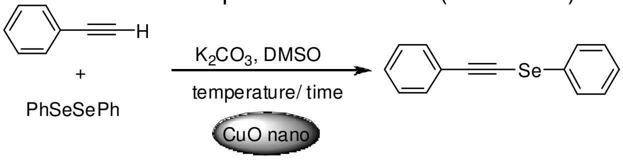
The most commonly method used for the synthesis of alkynyl calcogenides involves metal-assisted cross coupling reaction by using either Mg or Cu salts.[2] However, delicate reaction conditions or stoichiometric amount of metal salts were the main drawbacks for these protocols.

On the other hand, CuO nanopowder has emerged as a useful catalyst in several transformations, and it has also been employed with success in the synthesis of organochalcogenides.[3]

Thus, according to our ongoing research into organochalcogen chemistry, herein we have reported the synthesis of the alkynyl selenides and telurides by using CuO nanopowder as catalyst.

RESULTS AND DISCUSSION

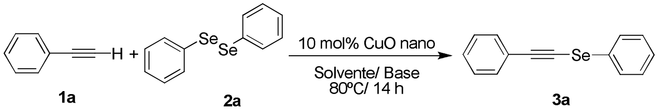
In order to optimize the best reaction conditions we used phenylacetylene and diphenyl diselenide as starting materials to afford the desired product. At first, we evaluated the amount of CuO nanopowder as well as the temperature and time (Scheme 1).



Scheme 1. Optimization for the reaction

Therefore, the best results were achieved by carrying out the reaction at 80 ℃, with 10 mol% of CuO nano for 14h. After the initial studies, we then evaluated the influence of differents bases and solvents on the reaction (Table 1). It is noteworthy that the best reaction condition was established by using DMSO as solvent and K_2CO_3 as base (entry 1).

Table 1. Optimization of the base and solvent

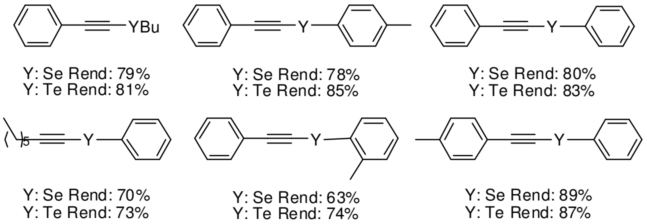


1a **2a** **3a**

#	Base	Solvent	Yield(%)[a]
1	K_2CO_3	DMSO	80
2	K_2CO_3	DMF	69
3	K_2CO_3	CH_3CN	51
4	KOH	DMSO	32
5	Na_2CO_3	DMSO	65
6	-	DMSO	traces

[a] Isolated yields.

With the best conditions in hand, we then examined the scope of our system, by reacting several acetylenes with different diorganoyl dichalcogenides. As depicted in Scheme 2, the desired products were obtained from moderate to excellent yield.



Scheme 2. Alkynyl chalcogenides synthesized

CONCLUSION

In summary, we have successfully developed an efficient and handle methodology to obtain alkynyl selenides and telurides from acetylenes and diorganoyl dichalcogenides, using CuO nanopowder as a recyclable catalyst.

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