Microwave-assisted one-pot synthesis of symmetrical dichalcogenides catalyzed by CuO nanopowder

Giancarlo V. Botteselle[a]*, Marcelo Godoi[a], Fábio Z. Galetto[a,b], Devender Singh[b], Luana Bettanin[a] and Antonio Luiz Braga[a]

[a]*Departamento de Química, Universidade Federal de Santa Catarina, 88040-970, Florianópolis, SC, Brazil.*

[b]*Departamento de Química, Universidade Federal de Santa Maria, 97105-900, Santa Maria, RS, Brazil.*

**e-mail:gian.botteselle@hotmail.com*

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INTRODUCTION

Over last few decades, organochalcogen (S, Se and Te) compounds have attracted important roles as reagents and synthetic intermediates in organic synthesis. Organodichalcogenides of sulfur, selenium or tellurium in counterpart of organic peroxides, play an important role in organochalcogen chemistry since they are stable, easy to handle, and reactive enough to produce eletrophilic, nucleophilic and radicophilic species.[1] In addition showed important biological activities, such as antioxidants and antitumor.[2]

Recently we developed a new methodology to synthesis a wide range of organodiselenides and ditelurides, through cross-coupling reaction of selenium or tellurium and aryl halides using CuO nanopowder as catalyst.[3]

So we describe here an improved microwave-assisted method to prepare organodiselenides, ditelurides and disulfides using CuO nanoparticles as catalyst.

RESULTS AND DISCUSSION

The synthesis of the diaryl/dialkyl dichalcogenides was carried out from the cross-coupling reaction between aryl or alkyl iodides and elemental chalcogens (S, Se and Te) in the presence of KOH (2.0 eq.), catalyzed by 5 mol% of CuO nanopowder in DMSO. The cross-coupling reaction was subjected to microwave irradiation (100W) for 7 min, at 80ºC (Scheme 1).

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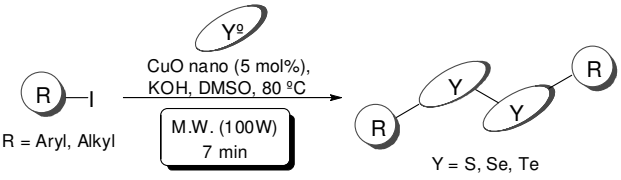
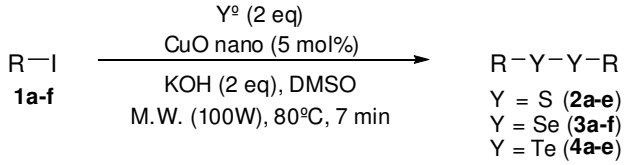


Scheme 1. General Synthesis of Dichalcogenides

This methodology was extended for a variety of iodides **1a-f** in the presence of sulfur, selenium or tellurium as summarized in the Table 1. It is noteworthy that this methodology was efficient to prepare a series of diaryl/dialkyl disulfides **2a-e**, diselenides **3a-e** and ditellurides **4a-d** (Table 1).

Table 1. Synthesis of organodichalcogenides.



entry	R	Y	product	yield (%)[a]
1	Ph (**1a**)	S	**2a**	67
2	4-OMe (**1b**)	S	**2b**	66
3	2-NH_2 (**1c**)	S	**2c**	55
4	4-Cl (**1d**)	S	**2d**	50
5	*n*-Bu (**1e**)	S	**2e**	51
6	Ph (**1a**)	Se	**3a**	70
7	4-OMe (**1b**)	Se	**3b**	76
8	2-NH_2 (**1c**)	Se	**3c**	61
9	4-Cl (**1d**)	Se	**3d**	85
10	*n*-Bu (**1e**)	Se	**3e**	55
11	3-OMe (**1f**)	Se	**3f**	94
12	Ph (**1a**)	Te	**4a**	65
13	4-OMe (**1b**)	Te	**4b**	55
14	2-NH_2 (**1c**)	Te	**4c**	54
15	4-Cl (**1d**)	Te	**4d**	45
16	*n*-Bu (**1e**)	Te	**4e**	50

[a] Isolated Yields.

CONCLUSION

In conclusion, a simple and efficient procedure was developed for the preparation of diaryl/dialkyl disulfides, diselenides and ditellurides. The use of microwave irradiation enables the synthesis of a wide range substituted symmetrical dichalcogenides in just few minutes in moderated to excellent yields.

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