



Stereoselective Synthesis of Divinylic Chalcogenides Using PEG-400

Liane K. Soares; Eduardo Q. Luz; Rodrigo Webber; Elton L. Borges; Gelson Perin.*

Centro de Ciências Químicas, Farmacêuticas e de Alimentos - LASOL - UFPel - 96010-900 Pelotas – Brasil

*Corresponding author. Tel.: +55-53-32757357, email: gelson_perin@ufpel.edu.br.

Keywords: Divinylic Chalcogenides; Stereoselective; PEG-400.

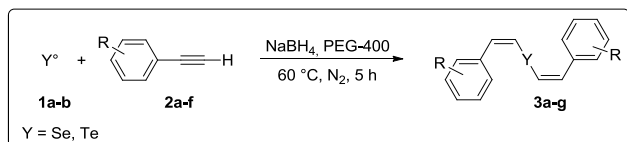
INTRODUCTION

Organoselenium compounds are attractive synthetic targets because of their interesting biological activities as antioxidant¹ and antifungal.² Among organochalcogen compounds, the divinylic selenides and tellurides play an important role in organic synthesis because they are attractive as key intermediate in organic synthesis.³ In this context, our group has studied the use of renewable feedstocks in organic synthesis, following green and sustainable chemistry principles⁴ and as a continuation of our studies in this area, we report herein the selective preparation of divinylic selenides and tellurides starting from terminal aromatic alkynes and selenium or tellurium powder using NaBH₄ as reducing agent and PEG-400 as solvent.

RESULTS AND DISCUSSION

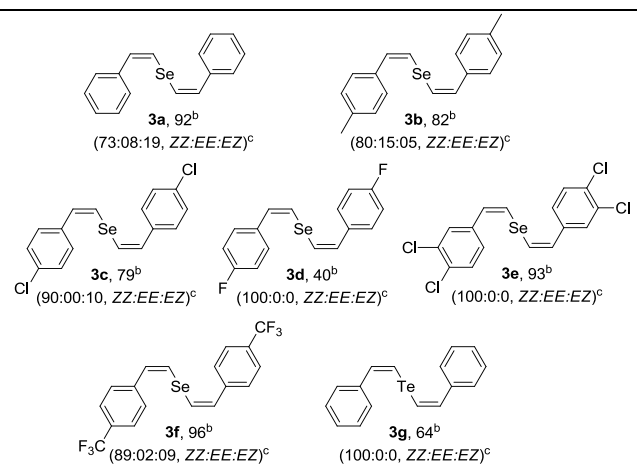
Initially, we chose Se⁰ **1a** and phenylacetylene **2a** as the standard starting materials to establish the best reaction conditions for the synthesis of divinylic selenide **3a**, using NaBH₄ and PEG-400 as solvent. We examined the influence of temperature, solvent, as well as the reaction time. The optimized reaction was established when Se⁰ **1a** (0.5 mmol) was reacted with phenylacetylene **2a** (1 mmol) in PEG-400 using NaBH₄ as reducing agent at 60 °C during 5 h, yielding **3a** in 92%. This condition was selective for (ZZ)-isomer (ratio = 73:08:19, ZZ:EE:EZ), Scheme 1.

Scheme 1. Synthesis of divinylic selenides and tellurides.



It is important to point that the reaction time was only 5 h; additional time did not improve the yields, and neither the use of solvents such as glycerol or ethanol resulted in a significant increase in yield. Thus, the methodology was extended with success to the synthesis of a range of divinylic chalcogenides (Table 1).

Table 1. Scope of the synthesis of divinylic selenides and tellurides.^a



^aReactions performed using **1a-b** (0.5 mmol), **2a-f** (1 mmol), NaBH₄ (0.8 mmol) and PEG-400 (3 g) under N₂ atmosphere for 5 h. ^bYields are given for isolated product. ^cDetermined by GC of the crude reaction mixture.

CONCLUSION

In summary, various divinylic chalcogenides were obtained using a green protocol and the desired products were obtained in good to excellent yields.

ACKNOWLEDGEMENTS

The authors thank CAPES, CNPq and FAPERGS.

REFERENCES

- Savegnago, L.; Borges, V. C.; Alves, D.; Jesse, C. R.; Rocha, J. B. T.; Nogueira, C. W. *Life Sciences* **2006**, 79, 1546.
- Líbero, F. M.; Xavier, M. C. D.; Victoria, F. N.; Nascente, P. S.; Savegnago, L.; Perin, G.; Alves, D. *Tetrahedron Lett.* **2012**, 53, 3091.
- Silveira, C. C.; Braga, A. L.; Vieira, A. S.; Zeni, G. *J. Org. Chem.* **2003**, 68, 662.
- Lenardão, E. J.; Freitag, R. A.; Batista, A. C. F.; Dabdoub, M. J.; Silveira, C. *Quim. Nova* **2003**, 26, 123.