Synthesis of 2-aryl-1,3-benzoselenazoles from bis(2-aminophenyl) diselenides and carboxylic acids using PBu_3

Cátia S. Radatz (PG),[1] Daniel S. Rampon (PG),[1] Renata A. Balaguez (IC),[2] Diego Alves (PQ),[2] Paulo H. Schneider (PQ)*[1]

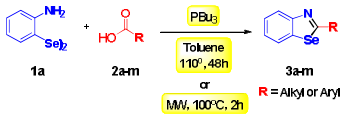
1. Instituto de Química, Departamento de Química Orgânica, Universidade Federal do Rio Grande do Sul, UFRGS, 91501-970, Porto Alegre-RS, Brazil; 2. Instituto de Química e Geociências, LASOL, Universidade Federal de Pelotas, UFPel, P.O. Box 354, 96010-900, Pelotas-RS, Brazil

**e-mail corresponding author: paulos@iq.ufrgs.br*

Keywords: Benzoselenazoles, heterocycles, selenium, carboxylic acids.

INTRODUCTION

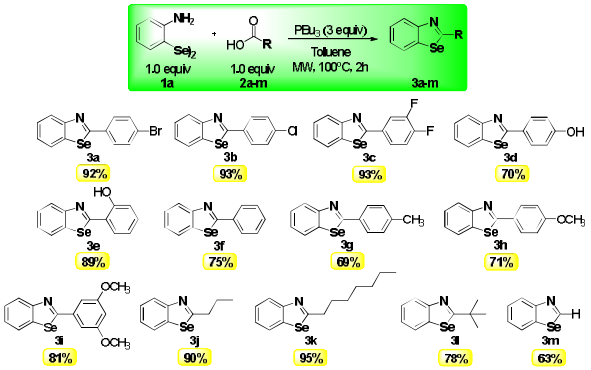
The investigation about different selenium-containing heterocyclic compounds has expanded rapidly during last years.[1] Furthermore, substituted benzochalcogenazole systems have presented also interesting pharmaceutical properties.[2] Besides, the synthesis of 2-substituted-1,3-benzothiazoles have attracted much attention according to their notably photophysical properties.[3] Our continuing interest on the synthesis of organoselenium compounds[4] prompted us to explore a general procedure to obtain 2-substituted 1,3-benzoselenazoles from bis(2-aminophenyl) diselenide (**1a**) and carboxylic acids (**2a**-**m**), using tributylphosphine in toluene under conventional heating or microwave irradiation (scheme 1).



Scheme 1. Synthesis of 2-aryl-1,3-benzoselenazoles (**3a**-**m**) promoted by PBu_3.

RESULTS AND DISCUSSION

In a first experiment, bis(2-aminophenyl) diselenide **1a** (1.0 equiv), acid 4-bromobenzoic **2a** (1.0 equiv) and tributylphosphine (1.0 equiv), were reacted in dichloromethane (5 mL) at room temperature. After 120 hours, the benzoselenazole **3a** was obtained in only 10% yield. In order to improve the yield, several parameters were screened. At first a variety of solvents were evaluated under reflux temperature (MeCN, THF, toluene, xylene and DMSO - 120°C). The best result afforded the product **3a** in excellent yield (97%) using toluene, 2.0 equiv of **1a** and 3.0 equiv of PBu_3 after 48 hours. Over recent years, it has been shown that the organic reactions can also be induce by microwave irradiation (MW),[5] along with reduced reaction times and good yields. In this sense, the suitable reaction conditions were employed under microwave heating, affording the product **3a** in excellent yield (92%) after only 2 hours (scheme 2). To explore the scope and limitations of this method, the reactions between a variety of carboxylic acids (**2a**-**m**) and **1a** were investigated under the improved conditions (scheme 2).



Scheme 2. Scope of the 2-substituted-1,3-benzoselenazoles synthesis.

Currently, we are working on the study of a probable mechanism employing NMR ^{77}Se and ^{31}P, and also evaluating the effect of microwave heating in acceleration of reaction times.

CONCLUSION

In conclusion, we present here a general and easy method for the synthesis of several 2 substituted-1,3-benzoselenazoles. The reaction afforded good to excellent yields after short reaction times under microwave irradiation. The mechanistic studies about this reaction are under evaluation.

ACKNOWLEDGEMENTS

CAPES, CNPq, INCT-Catalysis, FAPERGS, UFRGS and UFPel.

REFERENCES

[1] (a) Goodman, C. *Nature Chem. Bio*. **2013**, *9*, 214. (b) Koehnke, J.; et al. *Chem. Bio. Chem.* **2013**, *5*, 564.
[2] Tareq, M. et. al (Eds). *Topics in Heterocyclic Chemistry, Bioactive Heterocycles III.* Springer, Berlin, 2007.
[3] Gupta, A.; Rawat, S. *J. Curr. Pharm. Res*. **2010**, *3*, 13.
[4] Radatz, C.; et al. *Tetrahedron*. **2013**, *69* 1316.
[5] Kappe, C. O.; et. al (Eds.). *Practical Microwave Synthesis for Organic Chemists: Strategies, Instruments, and Protocols*. Wiley-VCH, Weinheim, 2009.