Tetrahedron Letters 58 (2017) 4436–4439

Contents lists available at ScienceDirect

Tetrahedron Letters

journal homepage: www.elsevier.com/locate/tetlet

Haloamination of an aminoallenylether and subsequent palladium-catalyzed cross coupling reactions to afford dihydrobenzoxazole derivatives containing conjugated substituents

Jihye Choi, Guncheol Kim *

Department of Chemistry, College of Natural Sciences, Chungnam National University, Daejeon 305-764, Republic of Korea

ARTICLE INFO

Article history:
Received 8 August 2017
Revised 26 September 2017
Accepted 3 October 2017
Available online 12 October 2017

Keywords:
Aminoallenylether
Haloamination
Heck reaction
Sonogashira reaction

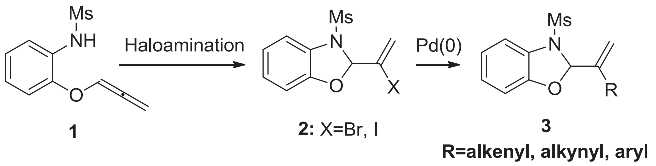
ABSTRACT

Haloamination of an aminoallenylether, which was prepared from commercially available 2-aminophenol via a three-step sequence, provided a versatile halovinyldihydrobenzoxazole intermediate. Subsequent Heck, Sonogashira, and Suzuki coupling reactions yielded dihydrobenzoxazoles possessing the corresponding conjugated substituents.

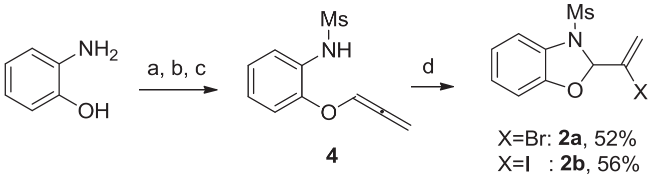
Allenes have been effectively utilized in the preparation of various cyclic compounds, in particular, under transition metal catalysis.[1] Additionally nitrogen containing heterocycles have been synthesized from synthetically versatile allenes via intramolecular carbo- and hydroamination processes.[2] The high reactivity and the presence of cumulated double bonds would permit further manipulation of the double bond which is formed after cyclization.

As an extension of our interests in cyclization reactions using allene derivatives,[3] we proposed a new route toward benzoxazole derivatives from an allenylether under palladium catalysis. However, during our studies, a very similar carboamination reaction for the synthesis of nitrogen-containing benzo-fused rings was reported by Beccalli and co-workers.[4] Therefore we decided to instead explore the intramolecular haloamination of an aminoallenylether followed by coupling reactions under palladium catalysis, such as the Heck, Sonogashira, and Suzuki coupling reactions to provide dihydrobenzoxazole derivatives containing conjugated substituents. Although this route is a two-step process, it is able to afford various conjugated derivatives among which could be difficult to form via direct carboamination (Scheme 1). Interestingly, no examples of the haloamino-cyclization of allenes has been reported.

The required aminoallenylether compound for the intramolecular cyclization suggested was prepared from 2-aminophenol *via* a three step sequence; (i) selective propargylation of an alcohol using NaH in DMF (60%), (ii) amine mesylation with methanesulfonyl chloride (99%), and (iii) isomerisation to allene **4** in the presence of *t*BuOK in THF (63%).[5] Subsequently, haloamination with *N*-bromo- and *N*-iodosuccinimide provided dihydrobenzoxazole vinylhalides **2a** and **2b** in 53% and 56% yield, respectively (Scheme 2).[6]



Scheme 1. Haloamination and subsequent palladium-catalyzed cross coupling reactions.



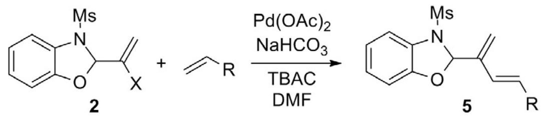
Scheme 2. Reagents and conditions: a) propargyl bromide, NaH, DMF, 0 °C, 60%; b) MsCl, pyridine, CH_2Cl_2, 99%; c) *t*-BuOK, THF, 63%; d) *N*-bromosuccinimide (or *N*-iodosuccinimide), CH_2Cl_2, 0 °C, 52% (56%).

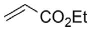
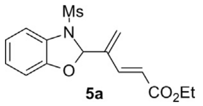
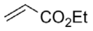
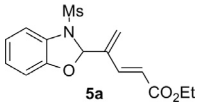
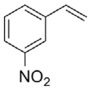
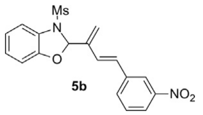
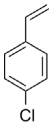
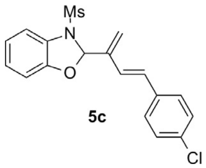
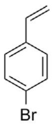
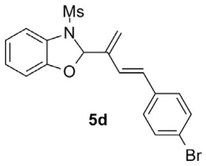
---

* Corresponding author.
E-mail address: guncheol@cnu.ac.kr (G. Kim).

https://doi.org/10.1016/j.tetlet.2017.10.006

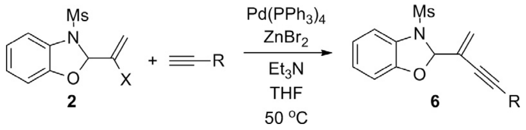
Table 1
Heck reactions of compound **2**.[a]

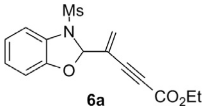
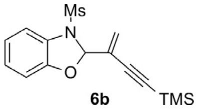
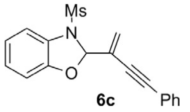


Entry	X	Alkene	T (°C) Time	Product	Yield **5** (%)[b]
1	Br		100 4 h	 **5a**	38
2	I		70 2 h	 **5a**	55
3	I		70 3 h	 **5b**	79
4	I		70 7 h	 **5c**	73
5	I		80 5 h	 **5d**	70

[a] Reagents and conditions: **2a** (0.329 mmol), alkene (3.0 eq.), Pd(OAc)$_2$ (5 mmol%), NaHCO$_3$ (2 eq.), TBAC (1 eq.) DMF (3 mL).
[b] Isolated yields.

Table 2
Sonogashira reactions of compound **2**.[a]



Entry	X	Alkyne	Time	Product	Yield **6** (%)[c]
1[b]	Br	$\equiv$—CO$_2$Et	2 h	–	0
2	Br	$\equiv$—TMS	24 h	–	0
3[b]	I	$\equiv$—CO$_2$Et	24 h	 **6a**	7
4	I	$\equiv$—TMS	1 h	 **6b**	72
5	I	$\equiv$—Ph	0.5 h	 **6c**	81

(*continued on next page*)