



Cyclization of Homoallylic Alcohols with Iodine/Iodine(III)

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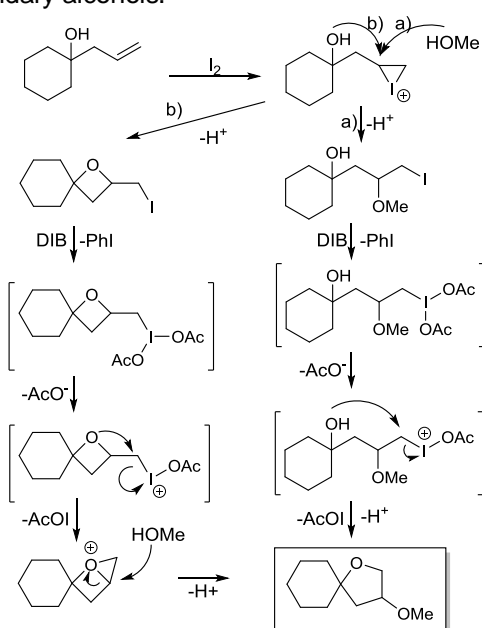
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INTRODUCTION

There is a great interest in the synthesis of substituted tetrahydrofurans, because they are present in many biological activity compounds.¹ THF compounds can be obtained by cyclofunctionalization of homoallylic alcohols.¹ Many electrophiles have been used, such as halogens, thallium(III), mercury(II), selenium, etc.¹ The iodocyclization of homoallylic alcohols with terminal double bonds leads to the formation of oxetanes.² This happens because the *5-endo-trig* cyclization is not favored for this type of substrate. An alternative protocol was developed by our group.³ The use of hypervalent iodine with a catalytic amount of molecular iodine facilitates the formation of tetrahydrofurans rings from homoallylic alcohols. The proposed mechanism (**Scheme 1**)³ consists mainly in the oxidative displacement of iodine from alkyl iodides and the ring expansion of cyclic ethers having an iodoalkyl substituent. In previous work, the reaction was explored with tertiary alcohols. In this study, we expanded the scope of the reaction for primary and secondary alcohols.



Scheme 1. Proposed Mechanism of Iodine/Iodine(III) cyclization

RESULTS AND DISCUSSION

The starting materials **1a-c** were prepared by Grignard reaction using allyl magnesium bromide and the corresponding aldehyde. The substrate **1d** was prepared from the opening of styrene epoxide by vinyl magnesium bromide, whereas **1e** is commercially available. The reaction of the homoallylic alcohols **1a-e** with HTIB (PhI(OH)OTs) and I₂ led to the formation of the desired products (**Table 1**). This reaction can be easily monitored by color change (**Figure 1**).



Figure 1. Color before and after the reaction completion

Table 1. Reaction of **1a-e** with I₂/HTIB

Entry	Substrate	Product	Yield
1			43% ^a (43:57) ^b
2			46% ^a (39:61) ^b
3			47% ^a (41:59) ^b
4			59% ^a (50:50) ^b
5			57% ^a (0:100) ^b

^a 2 equiv of HTIB, 0.2 equiv of I₂, MeOH, rt.; ^b ratio between diastereomer

CONCLUSION

This methodology can serve well for obtaining substituted tetrahydrofurans starting from primary and secondary homoallylic alcohols.

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REFERENCES

- Jalce, G.; Franck, X.; Figadère, B. *Tetrahedron: Asymmetry* **2009**, 20, 2537.
- Evans, R. D.; Magee, J. W.; Schauble, J. H. *Synthesis* **1988**, 11, 862.
- Vasconcelos, R. S.; Silva, L. F., Jr; Giannis, A. J. *Org. Chem.*, **2011**, 76 1499.