

Cyclic carbamates from (*R*)-(+)-limonene as monomers for isocyanate-free polyurethanes

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Introduction

Polyurethanes (PU) are among the most versatile class of polymers, being suitable for a large variety of applications. They are industrially prepared by chemical reaction between polyols and isocyanates.

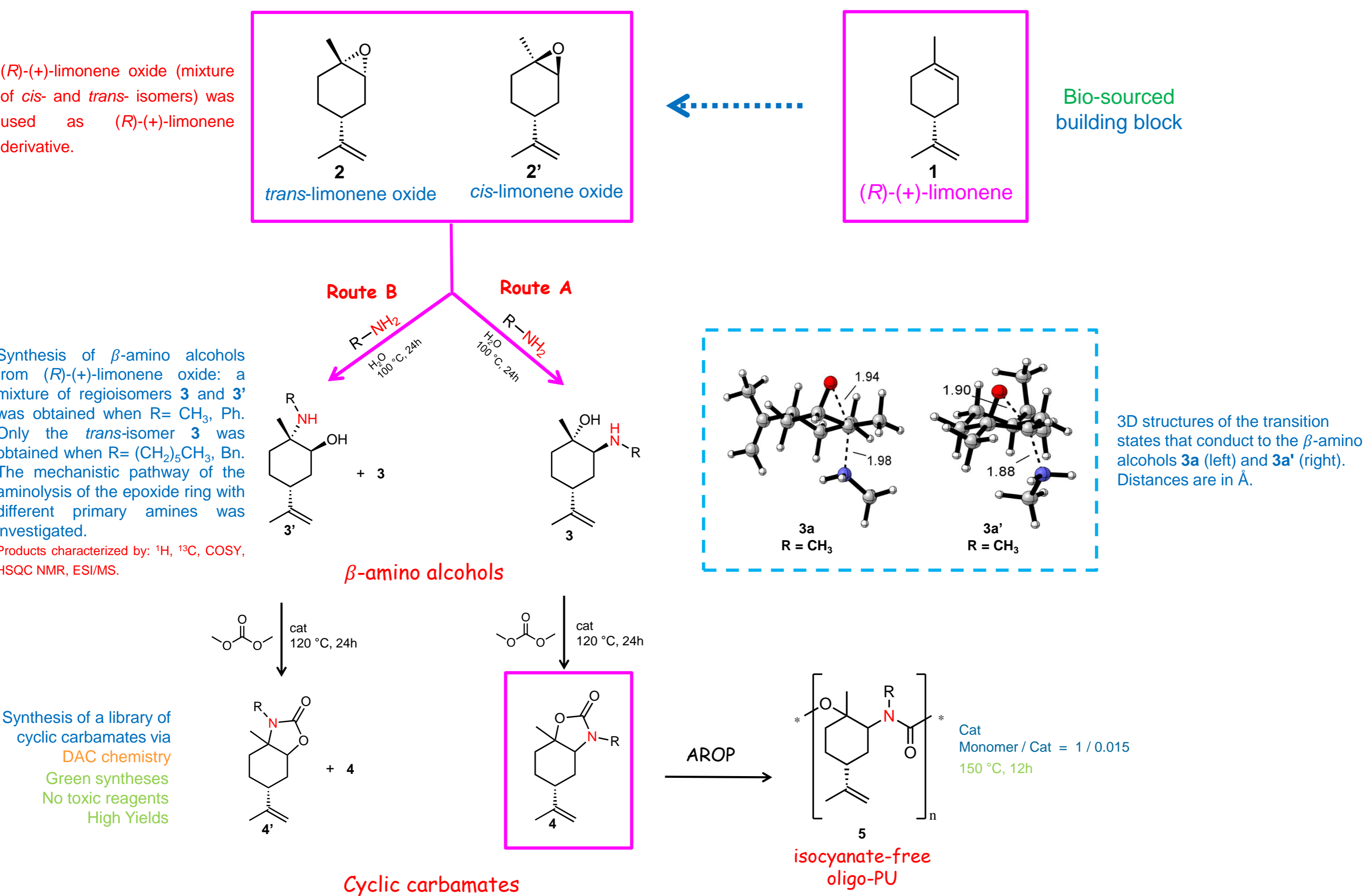
Isocyanates are known to be highly toxic for health and environment 😞

Objectives

😊 use of terpenes as bio-sourced building blocks for innovative platforms of chemicals;

😊 synthesis of isocyanate-free polyurethanes via Anionic Ring-Opening Polymerization (AROP) of cyclic carbamates derived from (*R*)-(+)-limonene.

The strategy



Conclusions

A novel synthetic pathway for the synthesis of polyurethanes without using toxic reagents, i.e. isocyanates, was designed and performed starting from natural sources. Libraries of β -amino alcohols and cyclic carbamates were efficiently synthesized from (*R*)-(+)-limonene. Cyclic carbamates are suitable monomers for the Ring-Opening Polymerization (ROP) to yield isocyanate-free polyurethanes. Anionic Ring-Opening Polymerization (AROP) was performed. A polyurethane oligomer was obtained, thus validating the synthetic pathway designed in this work for the synthesis of polyurethanes from natural sources and without the use of toxic reagent and solvents, following the principles of green chemistry.

References:

- [1] S. Neffgen, H. Keul, & H. Höcker, *Macromol. Rapid Commun.*, **1996**, 17(6), 373.
- [2] L. Rubino, A. Rescifina, V. Patamia, M. Galimberti, V. Barbera. Manuscript in preparation.
- [3] C.R. McElroy, F. Aricò, F. Benetollo, P. Tundo, *J. Appl. Chem.*, **2011**, 84(3), 707.
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