

N-HETEROCYCLIC CARBENE CONTROLLED DIVERGENT DEHOMOLOGATION OF ALDOSES

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Despite being Nature's biggest chiral pool, there is only a small set of standard carbohydrates, which are readily available (commercially and synthetically). In our research, we focus on the development of new synthetic methodology for the interconversion of abundant sugars to more exotic ones by utilizing the natural reactivity of the aldehyde moiety. Herein, we report our first breakthroughs in the organocatalytic anomeric activation with *N*-Heterocyclic Carbenes (NHCs, as highly aldehyde selective reagents) yielding defined dehomologation products.

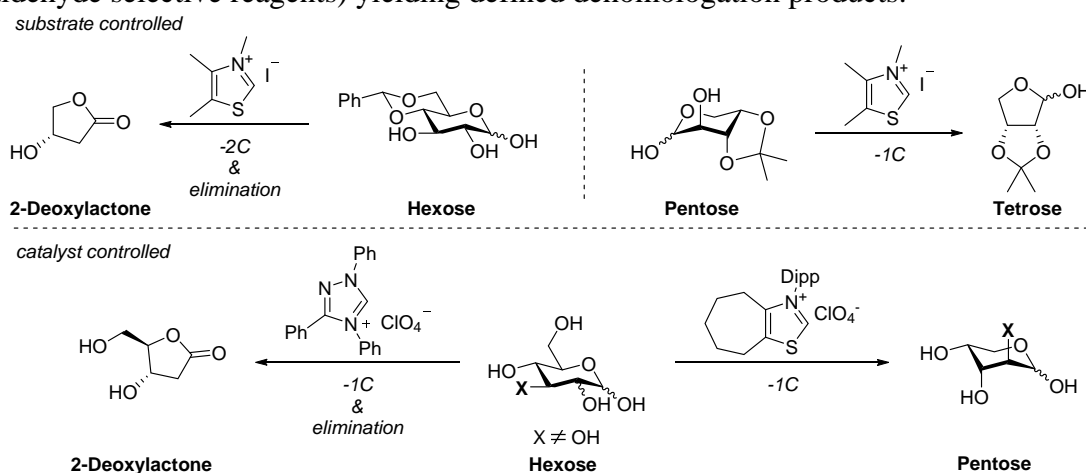


Figure 1 Substrate and Catalyst Controlled Activation of an Aldose going either way

Inspired by the reported use of sugars as sacrificial feedstock generating multiple C1-synthons under the mediation of NHCs^[1], we have changed perspective and focused on the sugar-based starting materials. Subjecting partially protected aldoses to the activation we delivered a proof of concept for the feasibility of a controlled dehomologation methodology when discovering examples of strong substrate control over the selectivity between the initially targeted pure dehomologation and a competing follow-up reaction - the NHC-triggered redox-lactonization (Figure 1, top).^[2] Aiming for a general solution, we targeted catalyst control over this type of divergence as ultimate goal. To facilitate the required evaluation of changes in reaction parameters as well as catalyst structure we developed a high throughput screening based on solid phase extraction, derivatization of sugar compounds and quantification *via* calibrated GC. This survey, lead to the aspired discovery of two types of catalysts giving either pure dehomologation or alternatively the subsequent redox-lactonization under otherwise identical conditions (Figure 1, bottom).^[3] We hope to have set the base for future applications studied by us and others based on NHC-catalysis under the specific and challenging conditions of reducing sugars as reaction partners.

[1] J. Zhang, C. Xing, B. Tiwari, Y. R. Chi, *J. Am. Chem. Soc.* **2013**, *135*, 8113-8116.

[2] S. Wendeborn, R. Mondiere, I. Keller, H. Nussbaumer, *Synlett* **2012**, *23*, 541-544.

[3] M. Draskovits, H. Kalas, C. Stanetty, M. D. Mihovilovic, Institute of Applied Synthetic Chemistry, TU Wien, **2019**.