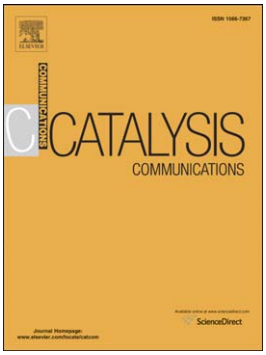

Efficient deuterium labelling of alcohols in deuterated water catalyzed by ruthenium pincer complexes

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Efficient deuterium labeling of alcohols in deuterated water catalyzed by ruthenium pincer complexes.

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Abstract

A series of isolated or preformed in-situ aliphatic PNP-type pincer ruthenium complexes have been evaluated for deuterium labelling of alcohols' C-H functions with deuterium oxide. Under our catalytic conditions, pincer-supported ruthenium complexes bearing cyclohexyl substituents on the phosphorous atoms have been found to be the most efficient and regioselective catalysts for α-deuteration of primary alcohols, affording up to 94% of *α*-C-H deuteration with only 5 % of *β*-C-H deuteration in the case of *n*-butanol.

Keywords: alcohol; deuteration; ruthenium; pincer complexes; hydrogen borrowing

Introduction

Alcohols are undoubtedly a very important class of organic compounds. Many usefull chemical and biochemical processes involve their transformation into valuable products or intermediates. In this context, regioselectively deuterium-labelled alcohol derivatives find a wide range of applications, as they can be used as powerful tools to investigate chemical/biosynthetic reaction mechanisms and to improve metabolic stability of drugs.[1] In the field of total synthesis, the influence of deuterated reactants on the reaction rate (namely, kinetic isotopic effects) has also sucessfully been applied, allowing optimization of reaction selectivity.[2] In addition, deuterated compounds can have more straighforward applications such as NMR solvents or internal standards in mass spectrometry. Usually, the incorporation of deuterium into alcohols in a regioselective manner at the α-C-H position can be achieved by conventional methods that however require multistep organic synthesis with the presence of expensive and/or hazardous deuterated reducing reagents such as $NaBD_4$, $LiAlD_4$, and $SiDR_3$, to be reacted with carbonyl derivatives.[3] Therefore, a regioselective, enviromentally-friendly method based on direct catalytic H/D exchange and using abundant D_2O as deuterium source is of high interest.[4]