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Chemoenzymatic cascades involving gold and enzyme catalysis

AUTHORS
VICENTE GOTOR-FERNANDEZ / UNIVERSITY OF OVIEDO, AVENIDA JULIAN CLAVERIA S/N, OVIEDO
Lorena ESCOT / UNIVERSITY OF OVIEDO, AVENIDA JULIAN CLAVERIA S/N, OVIEDO
Sergio GONZALEZ-GRANDA / UNIVERSITY OF OVIEDO, AVENIDA JULIAN CLAVERIA S/N, OVIEDO
Ivan LAVANDERA / UNIVERSITY OF OVIEDO, AVENIDA JULIAN CLAVERIA S/N, OVIEDO

PURPOSE OF THE ABSTRACT
The development of catalytic methods is a useful solution for synthetic challenges towards the preparation of valuable (enantioenriched) organic molecules. The combination of metal and enzyme catalysis has emerged a few years ago, allowing the design of more efficient and novel selective catalytic routes.[1] Moreover, these multicatalytic approaches have become more popular when they are carried out concurrently or sequentially in the same reaction vessel. However, they are usually hampered by (partial) incompatibility of the different catalyst types.

The design of metalloenzymatic cascades is particularly attractive, by means of one-pot sequential or cascade approaches towards chiral products.[2] In this context, the use of gold species allows to activate multiple C–C bonds under mild conditions, while enzymes provide multiple solutions for stereoselective synthesis (Figure 1).

Herein, the combined use of gold(I) species, particularly N-heterocyclic carbene complexes, and biocatalysts such as alcohol dehydrogenases or amine transaminases, have permitted the straightforward transformation of alkynes into chiral alcohols and amines with exquisite selectivity. The development of gold-catalyzed Meyer-Schuster rearrangements[3,4] and hydration reactions[5,6] will be disclosed, to subsequently perform on the carbonyl intermediates asymmetric bioreduction or biotransamination transformations in a concurrent or sequential manner.

FIGURES

FIGURE 1

Figure 1

Figure 1. Combination of gold species and enzyme for the development of chemoenzymatic cascades

FIGURE 2

KEYWORDS

Alcohol dehydrogenases | Amine transaminases | Chemoenzymatic cascades | Gold catalysis

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