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Review

Taylor-made palladium–pincer complexes: A new source of more efficient catalysts for sustainable organic synthesis

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ABSTRACT

The synthesis and catalytic activity of different pincer type palladium complexes synthesized in our laboratory are compiled in this report. The specific design of these palladacycles allows the employment of sustainable protocols and the recycle of the catalytic systems.

The results obtained by our group in this context will be compared with other previously reported and new advances in this field.

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1. Introduction

Palladium catalysts have become fundamental tools for a number of organic reactions. In the last decade, the following three topics have attracted much attention: (i) minimizing the relative amount of the metal containing catalyst, (ii) its recovery and recycling and (iii) the employment of environmentally more friendly methodologies.

Among the plethora of procedures developed to reach the aforementioned goals, the use of pincer type palladium complexes, that is, palladacycles containing tridentate ligands, has received special attention not only because of the appropriate balance between stability and reactivity but also for their high catalytic activity [1]. Moreover, the specific design of this type of complexes allows the use of sustainable protocols such as aqueous media or even their anchorage to solid supports, which makes easier the isolation of the reaction products as well as the recovery and recycle of the catalyst [2].

Following our research on the development of new catalytic systems and their application in C–C bond formation processes, several palladium pincer complexes have been prepared in our laboratories and tested as catalysts in different reactions. In this report, we wish to summarize the results achieved by our group in this context, with emphasis on the so-called "green chemistry". In addition, a critical comparison with related complexes from sources other than our own is also provided.

2. Symmetric pincers

Initially, on the basis of a much simpler synthetic sequence, we considered that pincer complexes with two identical donor groups were more appropriate to start our research in this field. Taking into account the already existing examples of symmetric pincer construction, we introduced slight modifications in order to improve catalytic efficiency and/or sustainability criteria.