Abstract

Since the synthesis, the isolation, and the characterization of the first stable N-heterocyclic carbene (NHC) in 1991 by Arduengo and collaborators, this class of ligands has attracted the attention of researchers for the synthesis of metal complexes active in different catalytic processes, and biological applications. The main advantages of NHCs are the facile modulation of the electronic and steric characteristics, the ease of manipulation, and interesting electron-donating properties.

During the last decades, the team I am part of has focused on the synthesis, characterization, and evaluation of catalytic and biological properties of NHC metal complexes. Our interest keeps in the study of the influence of substituents on nitrogen atoms and/or on the backbone might have on the performance of the complex in catalysis and biological environment.

In this doctoral thesis, the catalytic and biological activity of *N*-heterocyclic carbene silver and gold complexes will be examined. The catalytic performance will be evaluated in the A^3 (aldehyde, amine, and alkyne) coupling reaction, to lead propargylamines, and in the hydroamination of phenylacetylene with different arylamines, to produce the corresponding ketoimines. Finally, it will evaluate the antibacterial and the antitumoral activity of these complexes, against different bacterial strains and tumoral cells.

Chapter 1 gives an overview of *N*-heterocyclic carbene, the relative silver and gold complexes, and their biological and catalytic applications.

Chapter 2 reports the obtained results and is organized as follows:

Sections 2.1-2.4 are reported the synthetic strategies and characterization of NHC pro-ligands and the relative silver and gold complexes.

In Section 2.5, we have described the catalytic activity of silver and gold NHC complexes in the A^3-coupling reaction with p-formaldehyde, benzaldehyde, and cyclohexanal.

Section 2.6 reported the results obtained by Au-NHC complex in the hydroamination reaction of phenylacetylene.

Section 2.7 reported the biological activity of silver and gold complexes as potential antimicrobial and tumoral compounds.

Chapter 3 gives an overview of the obtained results in A^3coupling reaction and hydroamination of alkynes, and in the biological field, as antibacterial and antitumoral compounds, by silver and gold NHC, synthesized in this doctoral thesis.

Chapter 4 described the experimental part.