ABSTRACT

During the work done in this thesis, new catalysts based on metallic nanoparticles and clusters supported on materials with different properties have been designed and developed trying to improve their stability and potentiate their catalytic activity. For this reason, different physical and chemical properties (oxidation state, particle size, etc.) have been studied for each catalyst and, besides, mechanistic studies needed to optimize the performance of these materials in a specific reaction under the best possible experimental reaction conditions have been carried out.

In particular, chapters 3, 4 and 5 have been focused on the development of catalysts based on Au, Pd and CuO supported nanoparticles for the synthesis of organic compounds of interest in different fields. Specifically, it´s been possible to synthesize secondary amines, propargilamines, thioethers and amides with good yields, through sustainable methodologies like the hydrogen autotransfer or the oxidative amidation with molecular oxygen as the oxidant agent.

Besides, re-use of the different nanocatalysts has been evaluated systematically (aspect of great relevance from the industrial point of view), and also the scope of the reaction by using as starting materials reactants with different substituent groups in each reaction.

Finally, chapter 6 has been focused on the study of the catalytic activity presented by Au clusters supported on multi-walled carbon nanotubes (MWCNTs) in the formation of diphenyldisulfide starting from benzenethiol. It´s been demonstrated that the number of atoms that formed the cluster has a strong influence on its activity. Specifically, the catalyst shows high activities when the metallic cluster contains a number of atoms in the range between 5 and 10 atoms, while lower or higher cluster atomicities are associated to induction periods or inactive catalysts. The explanation resides in the activation capacity of the reactants presented by the metallic clusters with

atomicities inside the aforementioned range or interval, needed for reaction to take place.