

Summary

In the present Doctoral Thesis the development of new materials based on noble and seminobles metals has been studied for its application as catalysts in water treatment and as additives with biocide properties for fruit preservation and coating of surfaces.

Firstly, one of the principal aims is the decrease of the carcinogenic and toxic bromates in water using catalytic hydrogenation, obtaining harmless substances such as the corresponding bromides. To this end, different catalysts based on Pd supported in alumina and activated carbon fibers have been used. The physical, chemical and structural properties of these catalysts have been related to the catalytic activity in the hydrogenation of bromates anions. It has been determined that these catalysts are active at room temperature and atmospheric pressure, being the specie Pd(0) the catalytic active specie. A deep analysis of the results has demonstrated that big Pd nanoparticles present a better intrinsic activity, facilitating the dissociation of H₂ through the formation of β-PdH species, responsible of the catalytic reduction of bromates. However, the increase of the size of the Pd particles produces a decrease of the metallic dispersion over the support. Because of that, it is necessary to find an optimum between the dispersion and the Pd particle size in order to achieve the highest activity of the catalysts. Both factors depend on Pd content, on the Pd salt precursor and on the nature of the supports, being the most active catalyst per mol of Pd, the catalyst with 1wt. % of Pd supported in Al₂O₃ and prepared using PdCl₂. On the other hand, the influence of different variables of the reaction have been studied, checking that the reaction velocity is directly related to the bromates concentration and the parcial pressure of H₂.

Furthermore, the biocide capacity of different materials has been studied against diverse bacteria and fungi using both *in vitro* and *in vivo* test. The results determine that the most active materials are the Ag-exchanged zeolites, showing that the type of zeolitic structure, the Si/Al ratio and the silver content are the most significant parameters in the biocide activity of the materials. In that sense, the zeolites with large porous and large supercavities in their structures and with Si/Al ratio close to 2 are the most effective in all the studied applications, although the activity depends widely in the type of organisms treated. Thereby, the best results have been obtained with the materials based on the faujasite zeolite with a Si/Al ratio of 2.4 and doped with silver, being effective even with low contents of silver. Moreover, these Ag-zeolites have been incorporated in polymeric materials and covering materials, permitting their use for the fruit preservation and adding biocide properties to covering materials, such as packaging, worktops or surgical material.