Universidad de Alcalá

Comunidad de Madrid
Dirección General de Investigación e Innovación Tecnológica
CONSEJERÍA DE CIENCIA, UNIVERSIDADES E INNOVACIÓN

CATALOGUE

Chemistry and materials

Scientific and Technological Offer

Chemistry and Materials

- New organo-metallic catalysts for the manufacture of polymers
- Improved process for selective oxidation of sulfide groups to sulfone by silsesquioxane catalysts
- Disposable electrodes based on filtered nanomaterials
- Heterogenized NHC complexes of palladium and their uses as recoverable catalysts
- Very active aluminium catalysts in glycidyl methacrylate ring opening polymerization, for applications in electronic devices
- Portable device to detect, diagnose and monitoring of tyrosinemia

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NEW ORGANO-METALLIC CATALYSTS FOR THE MANUFACTURE OF POLYMERS

TECHNOLOGY OFFER

Code

QUI_UAH_01

Application areas

- Industrial Manufacture, Material and Transport technologies
- Other Industrial Technologies
- Agrofood Industry

Type of collaboration

- Joint venture agreement
- Manufacturing Agreement

Main researches

Prof. Tomás Cuenca Agreda

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ABSTRACT

Searching for catalytic processes directed towards the synthesis of new polymers and functionalized organic products (esters, epoxides or alkylsilane), is a topic of great interest followed by the companies of this sector. The obtaining of catalysts that can carry out these reactions more efficiently and selectively, provides a source of profits for these companies since the consumption of material and energy resources can be reduced drastically. Besides, the reduction or elimination of non-biocompatible metal charge of these polymers is essential to industrial scale, being controlled maximum permissible levels for those polymers used in food and agriculture fundamentally.

The new technology presented is develop with new catalysts based on coordination complexes and organo-metallic compounds of metals from the first groups of transition, alkali or alkaline earth metal and aluminum. Its special features allow them to be used in a wide range of sectors, including food industry, construction and petrochemicals.

ADVANTAGES AND INNOVATIONS

Due to its high efficiency, catalyst has to be used in small quantities allowing reaction products almost clean. This allows obtaining high quality polymers, also highly competitive in the market, because of the metal levels obtained, that are below than those required by the directives in the field of food and agriculture.

- New organo-metallic catalysts are highly selective
- They are very effective in the polymerization process
- The polymers obtained contain less amount of waste metal
- Biocompatible metal complexes for the synthesis of biopolymers

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IMPROVED PROCESS FOR SELECTIVE OXIDATION OF SULFIDE GROUPS TO SULFONE BY SILSESQUIOXANE CATALYSTS

Patent
ES2415529

Code

QUI_UAH_05

Application areas

- Other Industrial Technologies
- Biological Sciences
- Environment and risk prevention

Type of Collaboration

- Technical cooperation
- Commercial agreement with technical assistance
- License agreement

Main Researchers

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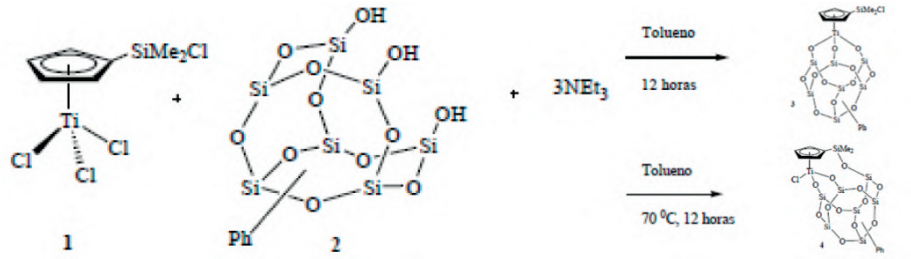

ABSTRACT

The present invention is based on the synthesis of titanium silsesquioxane compounds and its applications in oxidation catalyst of organic sulphur compounds using as oxidant tert-Butyl hydroperoxide and hydrogen peroxide.
In a first aspect, the present invention relates to the synthesis of the catalysts. The general procedure consists in the reaction of the titanium compound (1) with the partially condensed silsesquioxane compound (2) in the presence of a base such as trimethylamine all dissolved in an apolar solvent such as toluene.
The Catalyzing of oxidation of sulphides is the oxidation of the functional sulfide group to the functional sulfoxide group or sulfone, or both. It is carried out in presence of a titanium catalyst and a peroxide as a source of oxygen that could be TBHP o H2O2. It is used as a solvent, a nonpolar or aprotic medium, if the peroxide is TBHO or a polar or protic medium if the peroxide is H2O2. The process is carried out at atmospheric pressure and room temperature. On the assumption that both oxidation products are obtained, by adding another equivalent of peroxide, the reaction evolves over time toward the maximum oxidation product, which is sulfone.
The products are obtained in high capacity and purity

ADVANTAGES AND INNOVATIONS

- The catalysts are easy to synthesize and in the synthesis process is generated triethylammonium chloride, an inert inorganic salt, as the only byproduct derived therefrom. This salt is easily disposable by filtration.
- The catalysts are resistant to degradation under the conditions of catalysis.
- The titanium catalysts are slightly toxic. According to the International Agency on Cancer Research, titanium is not classified as a carcinogen element to humans.
- The Catalysis process can be performed without an inert atmosphere.
- The process shows improvements in the selectivity of the process, reaching capacities of a 100% in obtaining the sulfoxide.
- Once the sulfoxide has been generated, the same catalyst can be used for the synthesis of the sulfone.
- The oxidant used, preferably H202, is safe for the environment. Since the byproduct generated is water.
- The conditions of pressure and temperature are easily accessible.
- The procedure is simple, efficient and cheap, since the compound that would represent a higher cost, which is the catalyst, is used in a very low proportion.

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DISPOSABLE ELECTRODES BASED ON FILTERED NANOMATERIALS

Patent
ES2554203 (B2)
PCT
WO2015193520A1

Code

QUI_UAH_06

Application areas

- Industrial Manufacture, Material and Transport technologies
- Other Industrial Technologies
- Agriculture and Marine Resources
- Agrofood Industry
- Environment and risk prevention

Type of Collaboration

- Commercial Agency Agreement
- License Agreement

Main Researchers

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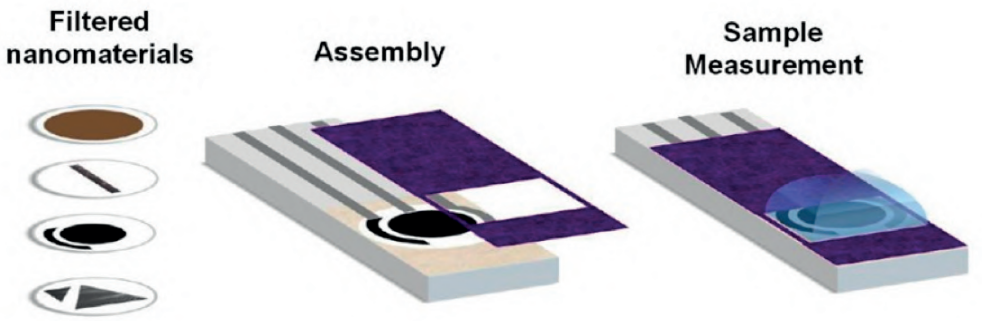

ABSTRACT

The analytical measurement has been important to progress in various areas of medicine, environment and industry. Disposable electrochemical electrodes, and particularly, screen-printed technology stands out because of its low cost and simplicity in electrical transduction.
Carbon nanomaterials among which are included, graphene and carbon nanotubes are one of the most important groups in the field of analytical detection, due to their excellent superficial properties, involving a much improved detection in terms of selectivity, sensitivity and reproducibility of chemical measurements.
Although commercial availability of electrodes constituted by only nanomaterials is zero, being applied mainly in the field of telecommunications, and it has developed a novel technology employing single-walled carbon nanotubes through which the material is embedded by direct pressure on a hard and non-conductive support by the use of hydraulic presses. The present invention provides an ideal alternative for the development of new electrodes based on conductive nanomaterials without any sophisticated equipment for its development. The most important characteristic for the development of this technology is the use of nanomaterials which are good electrical conductors.
The invention consists in the design and development of two types of electrodes:
Working electrodes, based on nanomaterials for use in conventional electrochemical cell, miniaturized or microfluidics.
Sensors based on conductor nanomaterials in which working and auxiliary electrodes are conductor nanomaterials and a reference electrode is painted with silver.

ADVANTAGES AND INNOVATIONS

- It is not need to use inks/ polymeric coatings that can reduce or modify the electrochemical signal, in contrast with traditional screen-printed/inject printed technologies.
- It allows increased surface area and avoids losses of nanomaterials, common in screen-printed processes (which wastes nanomaterial during the process) and the losses in the transferring process from bucky papers to polymeric surfaces.

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HETEROGENEIZED NHC COMPLEXES OF PALLADIUM AND THEIR USES AS RECOVERABLE CATALYSTS

Patent
ES2555328
PCT
WO2015197891

Code

QUI_UAH_07

Application areas

- Industrial Manufacture, Material and Transport technologies
- Other Industrial Technologies
- Agriculture and Marine Resources

Type of Collaboration

- Technical cooperation
- Commercial agreement with technical assistance
- License agreement

Main Researchers

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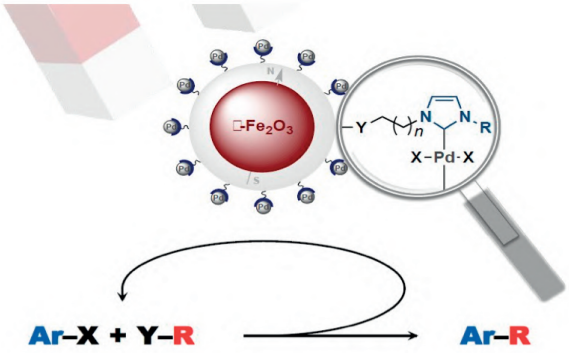
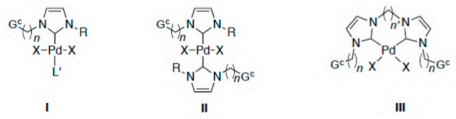


ABSTRACT

This invention involves the synthesis of (NHC) palladium complexes (PCs) with suitable substituents for their covalent grafting onto magnetic nanoparticles (MPs), resulting in nanomaterials containing the supported complexes (CMPs) as unique and well defined species of palladium tightly bound to the support. The CMPs give rise to stable dispersions in water and catalyze carbon-carbon bond formation processes in aqueous medium under mild conditions.
The invention is related to different aspects:

- New PCs of typologies I, II, and III.



- Synthetic methods for the new PCs of types I, II, III and their precursors.
- Procedures for the immobilization of types I, II, and III onto magnetic particles (MPs) of iron oxide to generate magnetic particles containing the supported complexes (CMPs).
- Use of such CMPs as catalysts for carbon-carbon coupling reactions.

ADVANTAGES AND INNOVATIONS

These catalysts are well defined, and after their use are easily separated from the products without degradation, they can be reused and do not contaminate the product with leached palladium, resulting in products of the catalysis with contents of less than ten parts per million, and sometimes even in the order of parts per billion, after magnetic separation of the particles.
The advantages of these catalysts are:

- Activity under mild conditions and in aqueous media.
- Robustness of the catalyst, which leads to a very high productivity.
- Ease separation from the catalytic products.
- Very low levels of palladium leaching, leading to products in which further work up to eliminate that metal it is not necessary.

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VERY ACTIVE ALUMINUM CATALYSTS IN GLYCIDYL METHACRYLATE RING OPENING POLYMERIZATION, FOR APPLICATIONS IN ELECTRONIC DEVICES

Patent
ES2610432 A1

Code

QUI_UAH_08

Application areas

- Information and Communication Technologies, Electronic
- Biological Sciences, Chemistry

Type of Collaboration

- Technical cooperation
- Commercial agreement with technical assistance
- License agreement

Main Researchers

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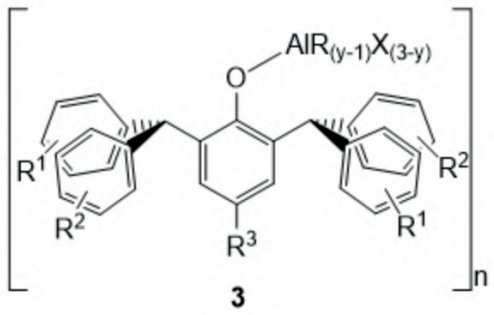

3

R^1 y R^2 = H, alkyl, haloalkyl, alkoxide, dialkylamine, halodialkylamine, hydroxyalkyl or nitrile
R^3 = H, alkyl, haloalkyl, cyanoalkyl, alkoxide, dialkylamine or nitrile
R = H, alkyl, alkenyl, alkynyl, aryl or alkoxide
X = halide.

General scheme of the aluminum catalysts type (3) used for the glycidyl methacrylate Ring Opening Polymerization processes described

ABSTRACT

This involves the synthesis of aluminum compounds of type (3) and the applications that these compounds have as catalysts in the ROP polymerization of glycidyl methacrylate in the absence of initiators or cocatalysts at room temperature and in short periods of time.

The compounds to which this invention refers can have different isomers or can be solvated or in the form of salts.

The glycidyl methacrylate ring opening polymerization processes are carried out in the presence of an aluminum catalyst of type (3) using an apolar medium, such as toluene as the solvent. The process is carried out at atmospheric pressure and room temperature.

This polymerization process shows a series of important advantages.

ADVANTAGES AND INNOVATIONS

- Catalysts are resistant to degradation under catalysis conditions
- They are carried out at room temperature and at atmospheric pressure
- The use of initiators or cocatalysts is not required for the polymerization process to take place
- Conversions are elevated to short polymerization times
- The procedure is simple, efficient and cheap, since the compound that would represent the greatest cost, the catalyst, is used in a very low proportion..