**Biohybrid material for removal of organic contaminants**

CSIC and an international company have developed a novel hybrid material consisting on an enzyme and a structure of nanowires of iron carbonate. The effect of this particular combination is an enhancement of the catalytic activity which leads to degradation of organic molecules at short times. The nanostructure shows magnetic properties, which allow a simple recovery of the catalyst from the reaction media.

Companies interested in the use of this catalyst, under patent license, are sought.

*An offer for Patent Licensing*

**Catalyst based on nanowires of iron carbonate**

Iron catalysis has gained an extraordinary attention in organic synthesis in the last years due to its price and its relative non-toxicity, comparing to other precious metals used commonly as catalyst. In particular, iron nanostructures have been strongly developed in the recent years, since their high surface-to-volume ratio makes them attractive candidates for catalysis applications. However, their synthesis usually requires strong conditions and is not always easy.

This invention provides a simple and green technology to produce for the first time a highly active, stable and reusable nanocatalyst: a bionanohybrid made up of small iron carbonate nanowires (4 x 50 nm) synthesized *in situ* in an enzyme matrix. The enzyme induces the *in situ* formation of the FeCO₃-nanowires on the protein network, giving them some special characteristics. This nanohybrid material also shows magnetic properties, which allows a rapid and simple recovering of the catalyst from the reaction media.

Testing of the present invention showed that contaminants as p-nitrophenol (150 mg/L) and p-aminophenol (100 mg/L) were rapidly degraded with only a very low amount of the bionanohybrid material (1 g/L). For the p-nitrophenol complete conversion into p-aminophenol was achieved in times of up to 30 seconds. For the p-aminophenol more than 98% degradation was achieved in 2 min and no traces of any compounds were detected by HPLC after 50 min. Those tests were carried out using the material in aqueous solutions.

**Main innovations and advantages**

- The material can be synthetized with a green method: in aqueous media, by a simple procedure, under air and at room temperature.
- The magnetic properties of the bionanohybrid catalyst allow a rapid and simple recuperation from the reaction media, facilitating therefore its reuse and its industrial application.
- Effective degradation of the organic pollutants was achieved in less than 2 min.
- The catalyst was reused at least 6 reaction cycles in the reduction of p-nitrophenol, keeping more than 95% activity.
- The catalyst showed an excellent stability against oxidation after 30 days of storing it at air conditions.

**Patent Status**

Priority patent application filed suitable for international extension

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