

Biohybrid catalyst with copper nanoparticles

CSIC has developed a novel hybrid material consisting on a protein matrix and nanoparticles of different copper species. The effect of the combination is an enhancement of the peroxidase activity of the material which leads to degradation of organic molecules at short times. It also shows an interesting catalase-like activity.

Industrial partners from the chemical or biochemical industry are being sought to collaborate through a patent license agreement

An offer for Patent Licensing

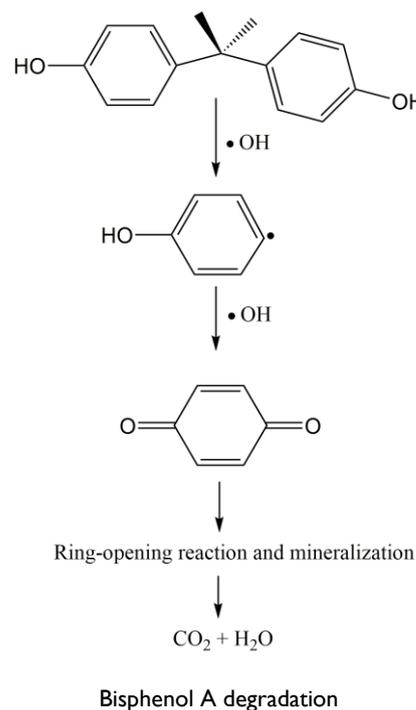
Catalyst with peroxidase and catalase-like activity

In the recent years there has been an increase in the use of copper nanoparticles as catalyst due to their high surface-to-volume ratio. However, the use of these nanoparticles is restricted by copper's inherent instability under atmospheric conditions, which makes it prone to oxidation. Therefore, the development of stable and robust copper nanoparticles is necessary, for its use as catalyst.

This invention provides a simple technology to produce a highly active, selective, stable and robust nanocatalyst: a bionanohybrid made up of copper nanoparticles synthesized *in situ* into an enzyme matrix. The method also allows directing the synthesis of the nanoparticles to obtain the desired copper nano-species.

These novel catalysts showed excellent catalytic performance in the degradation of a toxic and pollutant compound in aqueous media. For example, p-nitrophenol were completely reduced (starting with 150 ppm) into p-aminophenol in 15 seconds. For the degradation of bisphenol A (46 ppm), 95% of the same was removed after 20 minutes.

The catalase activity (degradation of H_2O_2) of the different synthesized bionanohybrids was evaluated showing a moderate specific activity of 2.49 U/mg in distilled water.



Main innovations and advantages

- The material can be synthesized with a green method: in aqueous media, by a simple procedure, under air and at room temperature.
- The control of the copper species, the size, crystallinity and morphology of the nanoparticles is possible changing some the conditions of the synthesis.
- Effective degradation of organic pollutants was achieved up to seconds.
- The catalysts exhibited an excellent stability maintaining 95% of the catalytic efficiency after 6 cycles of use.
- The bionanohybrid shows catalase-like activity
- The material can be used in different catalytic applications: bioremediation, drug intermediates synthesis, bionanosensors or antioxidant therapies.

Patent Status

Priority patent application filed suitable for international extension

For more information, please contact:

Sara Junco Corujedo

Institute of Catalysis and Petrochemistry

Spanish National Research Council (CSIC)

Tel.: 91 5854633

E-mail: s.junco@csic.es

comercializacion@csic.es