

EuropaCat 2025 Abstract e-book

Part 2: Abstracts for posters Monday, September 1

Organized in accordance with the order in [The Congress Program](#)

Content (topics order):

Hydrogen production in a low emissions scenario

Fine chemicals and polymer production

Special session 5: Frontiers in Enzyme Catalysis

CO₂ activation and upgrading

Special session 3: Catalysts and reactors under dynamic conditions for energy storage and conversion

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Bulk chemicals from fossil and renewable feedstock

Special session 6: Electrification of catalytic reactions and reactors

Advancements in catalysis

Horseradish peroxidase immobilized on biofunctionalized magnetite particles as potential biocatalyst for water treatment

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Enzymes are biological catalysts that are very effective in removing organic pollutants from water [1]. Horseradish peroxidase is an enzyme commonly used in wastewater treatment due to its ability to oxidize a wide range of organic pollutants. Most commonly, enzymes are applied immobilized on some solid supports, such as magnetic nanoparticles. The immobilization of peroxidases on magnetite nanoparticles not only increases their stability and catalytic efficiency, but also facilitates the efficient separation and reuse of the enzyme. [2]. Magnetic nanoparticles have been shown to be promising solid support due to their unique properties, such as large surface area, magnetic response, and easy recovery [3]. The performance of magnetite particles as enzyme carriers could be significantly improved if their synthesis is carried out in the presence of plant extracts [4]. Bioactive components, such as polyphenols, can be incorporated into the structure of the magnetite particles, increasing the presence of functional groups suitable for binding the enzyme to the magnetite surface.

In this work the properties of immobilized horseradish peroxidase on biofunctionalized magnetite particles were investigated. The magnetite particles were synthesized from iron II and III sulfate salts in the presence of tangerine peel extracts. The plant extraction was carried out by maceration at room temperature (25°C) using natural deep eutectic solvent (fructose and glycerol in relation 1:4) for 10 min. The extract obtained had a medium content of total phenols (0.009 mg CAE/mg) and total flavonoids (0.002 mgER/mg), and showed high anti-radical DPPH ability (IC₅₀ value was 0.96 mg/g). The Reducing Power test showed moderate activity, with an EC₅₀ value of 2.255 mg/g. The synthesized biofunctionalized magnetite particles were used as a solid support for the immobilization of peroxidase across glutaraldehyde. The obtained immobilized enzyme showed relatively high enzymatic activity (8.5 U/g), with the highest activity measured at pH 6 and 50°C. The immobilized enzyme retains more than 75% of its activity at temperatures of 25-50°C and pH values of 6-8 and could be used in a larger number of consecutive cycles. It can be concluded that immobilized peroxidase on biofunctionalized magnetite particles has a potential for application as a biocatalyst in water treatment.

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References

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