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Potential of laccase enzymes in industrial biotechnology

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The search for efficient and green oxidation technologies has increased the interest in the use of enzymes to replace the conventional non-biological methods. Enzymes recycling on molecular oxygen as an electron acceptor are the most interesting ones. Thus, laccases (benzenediol: oxygen oxidoreductases; EC 1.10.3.2) are promising enzymes for the development of enzyme-based oxidation technologies. Laccases belong to a group of polyphenol oxidases containing copper atoms in the catalytic centre, usually called multicopper oxidases. Laccases reduce elemental oxygen to water in a four-electron step and simultaneously perform one-electron oxidation of several aromatic substrates. Due to their redox potential (0.4-0.8 mV), laccases can only oxidise phenolic structures. However, it was shown that in the presence of small molecules capable to act as electron transfer mediators they were also able to oxidise non-phenolic structures, expanding, thus, the range of compounds that can be oxidised by laccases. This has greatly increased the interest in such enzymes. Laccase-mediated systems (LMS) have been applied to numerous processes such as pulp delignification, oxidation of organic pollutants and the development of biosensors or biofuel cells. However, despite the LMS has been studied extensively there are still unsolved problems concerned with mediator recycling, cost and toxicity. The use of naturally-occurring laccase mediators would present environmental and economic advantages. The main technological applications of laccases are in the textile, dye or printing industries – in processes related to decolouration of dyes– and in the pulp and paper industries – for the delignification of woody fibres, particularly during the bleaching process.

Biography

Susana Rodriguez-Couto obtained her Ph.D from the University of Vigo (Spain) in 1999. Then, she worked as a postdoctoral researcher at the University of Santiago de Compostela (Spain), as an Associate Professor at the University of Vigo, as an *Isidro Parga Pondal* Senior Research Fellow at the University of Vigo and as a *Ramon y Cajal* Senior Research Fellow at Rovira i Virgili University (Tarragona, Spain). Since January 2009, she holds a permanent position as an IKERBASQUE Research Professor at CEIT (San Sebastian, Spain).

She has participated in 12 research projects and supervised 6 master theses and 2 doctoral theses. Non-confidential results have led to over 90 international papers in outstanding journals, 67 communications at both national and international conferences and 6 chapters in books. She is member of the editorial board of different reputed journals.

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