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P105

SYNTHESIS OF TEXTILE DYES BY LACCASE BIOTRANSFORMATIONS

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Abstract

The use of biocatalysis for industrial synthetic chemistry is on the verge of significant growth. Enzymes are remarkable catalysts: capable of accepting a wide array of complex molecules as substrates, and exquisitely selective, catalysing reactions with unparalleled chiral (enantio-) and positional (regio-) selectivities. As a results, biocatalysts can be used in both simple and complex transformations without the need for the tedious blocking and deblocking steps in organic synthesis. Such high selectivity also effords efficient reactions with few by-products, thereby making enzymes an environmentally friendly alternative to conventional chemical catalysts.

The chemical production of dyes is extremely complex considering the great number and the variety of the reactions, intermediate compounds and end products. Usually these reactions can present risks with respect to the workers (toxic explosion, fire hazard by raw material and intermediate handling) but also for the environment (production of toxic and recalcitrant waste by-products). Therefore, there is an increasing interest to find alternative enzymatic processes for production of both existing and new dyes in order to develop cheaper, less dangerous and more environmental friendly reactions.

Laccases are excellent oxidative enzymes for aromatic compounds substituted by electro-donating groups: diphenols (ortho- and para-), polyphenols, phenols substituted by a methoxyl. The enzyme also oxydizes ortho- and para-quinones, aminophenols, aryldiamines, and polyamines. These simple molecules can serve as precursors for enzyme catalysed production of dyes under mild conditions (room temperature, absence of acids).

Some interesting results on synthesis of azo, phenazine and phenoxazine dyes using free or immobilized laccase will be presented.

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