

Tyrosinase as a versatile biocatalyst

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Tyrosinase (E.C. 1.14.18.1) is a kind of Cu-containing oxidoreductase and widely distributed in nature from bacteria to mammal. Tyrosinase exhibits not only broad substrate spectrum for various phenolic compounds but also two catalytic activities using O₂ as the electron acceptor, o-hydroxylation of monophenol to diphenol by a cresolase activity and oxidation of diphenol to quinone by catecholase activity. Accordingly, its practical applications have been intensively researched in the fields of bioremediation for detoxifying phenolics, bioelectronics for detecting phenolic compounds, and biopharmaceuticals for producing L-DOPA. This presentation focuses on that (i) tyrosinase-based electroenzymatic system achieves outstanding L-DOPA conversion rate as well as productivity, and (ii) catalytic promiscuity of tyrosinase is capable of cleaving 4-O-5 and C_α-C_β bonds in phenolic lignin model dimers. Consequently, tyrosinase is a versatile enzyme to be applicable for L-DOPA production in industrial scale and sustainable lignin utilization to value-added phenolic derivatives.