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Laccase immobilization on multi-walled carbon nanotubes-Chitosan composite beads

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Chitosan, a deacetylated derivative of chitin, is a natural, low toxic, biodegradable, biocompatible, bioactive polymer. Based on its many favourable characteristics, chitosan have attracted considerable attention in the areas such as biotechnology, biomedicine, food and cosmetics. The renewable biopolymer chitosan is known as an ideal support material for enzyme immobilization. Enzymes are often immobilized onto or into solid supports to increase their thermostability, operational stability and recover. Recently, there has been a growing interest in chemical or physical modification of chitosan to improve its solubility and widen its environmental and biomedical applications. The present study was investigated for immobilization of laccase on modified chitosan and to find kinetic parameters, thermal stability, storage stability and operational stability for immobilized laccase. Laccases (benzenediol:oxygen oxidoreductase, EC 1.10.3.2) are oxidative enzymes actively being studied for bio-application in various types of activities such as environmental bioremediation decolourisation and chemical syntesis. In the first step of study, multi-walled carbon nanotube-chitosan (MWCNT- CS) composite beads were prepared for immobilization of enzyme as a carrier. The composite beads were characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analyse (TGA). The obtained data show that MWCNT-CS composites have good dispersibility and stability in aqueous solution. In the second step of study, the enzyme was immobilized on MWCNT- CS beads by covalently using glutaraldehyde as a cross-linking agent. The yield of the immobilization and enzyme activity were recoeded % 83 and 3.51 U/gr carrier. The kinetic parameters free and immobilize laccase were calculated using ABTS as a substrat and Km value for free end immobilize laccase were found as 0.301 mM and 0.502 mM respectively. The results show that prepared MWCNT-CS composites are biocompatible and possess high enzyme immobilization efficiency, favoring potential application as protein carrier systems. Finally, potentials of the catalysts were tested in the decolourisation of textil dye.

Biography

Tülin Aydemir has a PhD degree in Biochemistry from Ege University in Turkey. Currently, he is doing research in the area of enzyme immobilization on different supports, the synthesis of supports for enzyme immobilization, metal adsorption from waste waters and stress biochemistry. He has published more than 25 papers in SCI journals.

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