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Nanočestice magnetita kao imobilizacioni matriks za peroksidazu iz rena

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Peroksidaze predstavljaju veliku grupu enzima koji se intenzivno koriste u tretmanu otpadnih voda. Slobodne oblike ovih enzima karakteriše kratko vreme operativne stabilnosti. Primenom postupka imobilizacije povećava se stabilnost enzima, kao i mogućnost njihove regeneracije i ponovne upotrebe. Cilj ovog rada bio je ispitivanje aktivnosti imobilisanog i neimobilisanog enzima peroksidaze dobijenog iz rena (HRP) u vremenskom periodu od mesec dana. Enzim je procesom adsorpcije imobilisan na nanočesticama magnetita (Fe_3O_4) prethodno sintetisanim iz Fe^{2+} i Fe^{3+} sulfatnih soli metodom koprecipitacije na sobnoj temperaturi (25^oC). Aktivnost slobodnog enzima u rastvoru na sobnoj temperaturi iznosila je 3,8 U/ml, pri čemu je enzim nakon dva dana potpuno izgubio svoju aktivnost. Čist magnetit je pokazao veoma slabu katalitičku aktivnost (0,3 U/g). Pri istim reakcionim uslovima, aktivnost imobilisanog enzima je bila dva puta veća (8,0 U/ml) i ostala je nepromenjena tokom celog ispitivanog perioda (mesec dana). Dobijeni rezultati potvrđuju prednost korišćenja magnetita za imobilizaciju enzima, kao i potencijalnu primenu ovakvog enzima u tretmanu fenolnih otpadnih voda.

Magnetite nanoparticles as immobilization matrix for horseradish peroxidase

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Peroxidases represent a large group of enzymes that have been used extensively in wastewater treatment. Free forms of enzymes have short-term operational stability. The immobilization procedure increases the stability of enzymes, as well as possibility of their regeneration and reuse. The aim of this study was to investigate the activity of the immobilized and free peroxidase obtained from horseradish (HRP) during one month. The enzyme was immobilized by adsorption process on magnetite nanoparticles (Fe_3O_4), previously synthesized from Fe^{2+} and Fe^{3+} sulfate salts by co-precipitation method at room temperature (25^oC). The activity of the free enzyme in solution at room temperature was 3.8 U/ml, and after two days, the enzyme completely lost its activity. Pure magnetite has shown very low catalytic activity (0.3 U/g). Under the same reaction conditions, the activity of an immobilized enzyme was twice as high (8.0 U/ml) and remained stable during the whole measuring period (one month). The obtained results of improved activity and stability confirm the advantage of using magnetite nanoparticles for enzyme immobilization, as well as the potential use of this enzyme in phenolic wastewater treatment.

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