ABSTRACT

IMMOBILIZATION OF PAPAIN ONTO MAGNETIC NANOPARTICLES AND USAGE FOR ENZYMATIC HYDROLYSIS OF PROTEINS

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In this thesis, magnetic poly(HEMA-GMA) nanoparticles were prepared by emulsion polymerization technique and Cibacron Blue F3GA was covalently attached to these magnetic nanoparticles. Synthesized magnetic nanoparticles were characterized by using FTIR, ESR, SEM, AFM and SEM-EDX analysis. It was shown that, synthesized nanoparticles demonstrated magnetic behavior and have spherical shape with approximately 200 nm diameter. Cibacron Blue F3GA loading onto magnetic poly(HEMA-GMA) nanoparticles was calculated to be 173.96 μmol/g polymer. Papain adsorption studies onto dye attached magnetic nanoparticles were performed in a batch system and effects of pH, initial papain concentration, medium temperature and ionic strength on the papain adsorption were also investigated. Maximum adsorbed amount of papain onto dye attached magnetic nanoparticles was found to be 764.0 mg/g polymer by using 1.0 mg/mL of papain concentration in pH 7.0 HEPES buffer. The effectiveness of adsorption was demonstrated by Freundlich isotherm proficiency. Effects of pH and temperature on free and immobilized enzyme activities were also investigated. The results showed that pH, thermal, operational and storage stabilities of the immobilized papain were higher than those of the soluble papain. Additionally kinetic constants of soluble and immobilized papain were determined. In this work, the catalytic effiency on different proteins (casein, BSA, IgG and cytochrome C) of immobilized papain was investigated and the highest catalytic efficiency was achieved with IgG. These features make the dye-ligand Cibacron Blue F3GA attached magnetic affinity nanoparticles a good candidate for immobilization of papain.

Key Words: Papain, magnetic nanoparticle, immobilization, Cibacron Blue F3GA