SYNTHESIS OF MAGNETIC NANO-POLY[(HYDROXYETHYL METHACRYLATE)-CO-(METHACRYLAMIDOPHENYLALANINE)] AND THEIR UTILIZATION AS AN AFFINITY SORBENT FOR LYSOZYME ADSORPTION

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During the past decade, much attention has been paid toward polymeric nanoparticles. Being an important part of nanoscale polymers, polymeric nanoparticles, especially, those with narrow distribution of particle sizes and diameter lesser than 100 nm, have different unique properties, such as superhigh specific surface area, stable configuration, good processing properties, and capability of getting modified easily through chemical or physical ways, distinguishing themselves from atoms, molecules, and macroscopical substances.

Various adsorbent materials have been reported in the literature for protein adsorption. We have developed a novel and new approach to obtain high protein-adsorption capacity utilizing a methacrylamidophenylalanine-containing nanostructures. An amino acid ligand methacrylamidophenylalanine (MAPA) was synthesized from methacrylochloride and phenylanine. Then, mag-nano-poly[(2-hydroxyethyl methacrylate)-co-(2-methacrylamidophenylalanine)] [mag-nano-p(HEMA-co-MAPA)] nanostructures [with an average size of around 386 nm were prepared by surfactant free emulsion polymerization. The nanostructures had a specific surface area of 580 m²/g and characterized by scanning electron microscopy (SEM), ESR, Zeta-size and zeta-potential, elmental analysis and Fourier Transform Infrared Spectroscopy (FTIR). These nanostructures were used in the adsorption of lysozyme (0.1-2.0 mg.ml⁻¹) at different pH values (4.0-11.0). The non-specific adsorption of lysozyme on the nano-pHEMA nanostructures was 22.0 mg/g. Incorporation of MAT molecules into the polymeric structure significantly increased the lysozyme adsorption up to 400 mg/g nanostructures. More than 92% of the adsorbed lysozyme was desorbed in 1 h in the desorption medium containing 1.0 M NaCl. The p(HEMA-co-MAT) nanostructures are suitable for repeated use for more than 10 cycles without noticable loss of capacity. These features make mag-nano-p(HEMA-co-MAPA) nanostructures a very good candidate for bioaffinity adsorption.