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Magnetite Nanoparticles Immobilized Pectinase: Preparation, Characterization and Application for the Fruit Juices Clarification

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Abstract : In this work, pectinase was immobilized on the surface of silica-coated magnetite nanoparticles via covalent attachment. The magnetite-immobilized enzyme was characterized by Fourier transform infrared spectroscopy, X-ray powder diffraction, scanning electron microscopy and vibrating sample magnetometry techniques. Response surface methodology using Minitab Software was applied for statistical designing of operating conditions in order to immobilize pectinase on magnetic nanoparticles. The optimal conditions were obtained at 30°C and pH 5.5 with 42.97 µl pectinase for 2 h. The immobilization yield was 50.6% at optimized conditions. Compared to the free pectinase, the immobilized pectinase was found to exhibit enhanced enzyme activity, better tolerance to the variation of pH and temperature, and improved storage stability. Both free and immobilized samples reduced the viscosity of apple juice from 1.12 to 0.88 and 0.92 mm2s-1, respectively, after 30 min at their optimum temperature. Furthermore, the immobilized enzyme could be reused six consecutive cycles and the efficiency loss in viscosity reduction was found to be only 8.16%.

Keywords : magnetite nanoparticles, pectinase enzyme, immobilization, juice clarification, enzyme activity
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