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Magnetic nanoparticles surface modified with chitosan as support for cellulase enzymes

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The cellulases enzymes immobilization by synthesis of magnetic cross-linked enzyme aggregates (MCLEAs) appears as a promising and suitable strategy for improve of lignocellulosic hydrolyses due to its low cost, easy preparation, high enzymatic activity and stability over a wide pH and temperature range. So, here we report the synthesis of tree cellulase MCLEAs (using different precipitant agent) and the study of influence of pH and temperature in the activity of all synthesized MCLEAs. The MCLEAs were obtained by reaction of cellulase enzyme and chitosan coated magnetite nanoparticles (CH-Fe3O4). In the synthesis was used glutaraldehyde as cross-linker agent and evaluated the effect of different precipitant agent (ethanol, PEG 600 and (NH4)2SO2) in the activity enzymatic of the obtained MCLEAs. Moreover, the optimal operational condition for each MCLEA was studied in the pH and temperature range of 3-8 and 30-70 °C, respectively. The immobilization of cellulase CH-Fe3O4 was confirmed by infrared spectroscopic. All MCLEAs show bands near at 1650 cm-1 (?C=O of amide group from cellulase); 1400 cm-1 (?NH of amine group from cellulase) and 1260 cm-1 (?OH from the interaction of the carbonyl group of cellulases with hydroxyl group of chitosan). Higher enzymatic activity was obtained when ethanol was used as precipitant agent (pH 4 and 55 °C). Besides increase of thermal stability of cellulase, the employed immobilization methods (independent of precipitant agent used) change the optimal pH from 5 to 4 when compared to free enzyme. Lastly, additional studied about recovery capability and the application of the MCLEAs in the lignocellulosic biomass hydrolysis is necessary to finish this work.