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Ultrasound effects on the activity of free and immobilized urease on the magnetic nanoparticles and silica gel

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Abstract

In this study, the effect of low-frequency ultrasound on the structure and activity of urease enzyme has been investigated. For this purpose, the enzyme was exposed to ultrasound with 20 kHz frequency at different time intervals. The urease enzyme was immobilized on the surface of magnetic nanoparticles (Fe_2O_3), and activated silica gel with 89% and 66% efficiency respectively. The enzyme activity, kinetic parameters, optimum pH and temperature were determined for free and immobilized enzymes at different conditions. The structure change of free enzymes caused by ultrasound was vreified by fluorescence and UV spectrum. The activity of enzyme was amplified in the presence of ultrasound. A reduction in the activity and V_{max} and an increase in K_m were observed for both free and immobilized enzymes on the activated silica gel after ultrasound treatment. While, ultrasound had no effect on the immobilized enzymes on the magnetic nanoparticles.

Keywords: Urease, Ultrasound wave, Enzyme immobilization, Fe_2O_3 magnetic nanoparticle, Silica gel.

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