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Efficiency of sono-nano-catalytic process of magnesium oxide nano particle in removal of penicillin G from aqueous solution

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ABSTRACT

Antibiotics act as an ecological factor in the environment that could potentially affect microbial communities. The aim of this study is to evaluate the applicability of magnesium oxide nano-particles (MgO-NPs) for the removal of penicillin G (PG) from aqueous solution using sono-nano-catalytic process. The structural properties of the MgO -NPs were established using transmission electron microscopy (TEM) and Fourier transform infrared (FTIR) techniques. Effects of independent variables such as pH, catalyst dose, contact time, and initial concentrations of PG on the removal efficiency of PG were examined. Pseudo-first-order and pseudo-second-order kinetic models were applied at optimum condition to study the PG disintegration kinetics. All experiments were performed under ultrasonic irradiation in ultrasonic bath at a frequency of 60 kHz. Optimum conditions of pH 3, nano-particle concentration of 1.5 g/L, reaction time of 60 min, and initial concentration of 80 mg/l were obtained for the PG removal using sono-nano-catalytic process, which gave removal efficiency of 81.14%. The sono-nano-catalytic experimental data was found to fit the pseudo-first-order kinetic model (R^2 = 0.9140) than the pseudo-second-order model (R^2 = 0.7766). The results of this study showed that the sono-nano- catalytic process using MgO-NPs is very effective and can be used for removal of PG antibiotics from aqueous solutions.

Keywords: Penicillin G; Sono-nano-catalytic; MgO nano-particle; Aqueous solution

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