PARAMETRIC INVESTIGATION OF THE PERFORMANCE OF GOLD NANOPARTICLES AUGMENTED CELLULOSIC MICROCAPSULES BY ALGINATE ENCASULATION FOR P-NITRPHENOL DEGRADATION

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AUTHOR'S DECLARATION

I declared that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The gold nanoparticles augmented with cellulosic microcapsules by alginate encapsulation method was studied for the parametric investigation of its performance in P-nitrophenol degradation. The objectives of this experiment are to determine the parametric of AuNP-cellulose catalyst dosage on removal efficiency and AuNP-cellulose reaction in PNP degradation at different temperatures. Then, the kinetic model of gold nanoparticles in p-nitrophenol degradation is determined. In this work, the gold nanoparticle was prepared by using citrate reduction method and it was further synthesis with coconut husk cellulose. Then, the gold nanoparticles (AuNPs) with cellulose was transformed into microcapsules by alginate encapsulation technique. Then, gold nanoparticle-cellulosic microcapsule beads were formed. Hence, the catalytic performance of AuNPs for the reduction of P-Nitrophenol (PNP) was tested as a model reaction with an excess amount of sodium borohydrate, $NaBH_4$. After that, the removal efficiency of PNP by gold nanoparticle augmented cellulosic (AuNP-cellulosic) microcapsules dosage, reduction of PNP within varies of temperatures by kinetic reaction of AuNP-cellulosic and kinetic study of AuNP-cellulosic in PNP conversion will be investigated by using UV-Vis spectrometry. For dosage of AuNP-cellulose catalyst on PNP removal efficiency, the amounts of AuNP-cellulose were weighted to 5, 7 and 10 mg. From the result obtained, it shows that at 10 mg of AuNP-cellulose

catalyst dosage, the PNP removal achieved is 96.1%. The removal efficiency is increase within the increase of amount of AuNP-cellulose catalyst dosage. Moreover, for reactions of AuNP-cellulose in PNP degradation within different temperatures (28, 35, 45 and 55^{o}C) clarify that the temperatures play an important role for degradation of PNP. From the result, it shows that, the higher the temperature the faster the reaction of PNP to reduce. Also it was determined that the activation energy (Ea) for PNP degradation to PAP is 13.63 kJ/mol for catalytic system based on AuNP-cellulose catalyst.