

SYNTHESIS OF MAGNETIC NANOPARTICLES USING ELECTROCHEMICAL METHOD

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ABSTRACT

The main objectives of this research are to synthesize of magnetic nanoparticles using electrochemical method and to evaluate the effect of operating conditions on particles characteristics.

The anode was prepared by electroplating iron plate $FeSO_4$ solution with current density of $0.167 A/dm^2$ for 6 hours. Then, the electroplated was functioned as anode in the next experiment that was used to produce Fe_3O_4 particles. Using deionized water as an electrolyte, electrolysis process for synthesizing of Fe_3O_4 was performed for 12 hours. To get the best result, experiments were performed with using various parameters such as temperature, pH, and current density. Particle produced that were dispersed in the solution were then separated and dried. The dried particles were characterized by X-ray Diffraction and Scanning Electron Microscopy. In these experiments, Overpotential was also measured, to know the effect of electric current on the electrode reaction occurred at the interface.

Electrochemical method with simple route can produce Fe_3O_4 particles although there was a little formation impurities such as $FeOOH$ and tend to form agglomerate. From the result of XRD and SEM analysis at

those variables, showed that the best result of Fe_3O_4 particles were obtained at pH 7, temperature of 30 °C and under current density of $70 \mu A/cm^2$.

Keyword : electrochemical, magnetic nanoparticles, X-Ray Diffraction, Scanning Electron Microscopy.

