SYNTHESIS AND CHARACTERIZATION OF MAGNETIC NANOPARTICLES OF IRON SAND-BASED Fe3O4 FROM BEACH OF GLAGAH KULON PROGO IN YOGYAKARTA USING COPRECIPITATION METHOD

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ABSTRACT

This study aims to determine how to synthesize magnetite Fe3O4 nanoparticles from iron sand extract by coprecipitation method. This study also aims to determine the effect of HCl temperature differences on the dissolution process of iron sand on lattice parameters, crystal structure, nanoparticle size of surface morphology, chemical composition and magnetic properties of synthesized magnetite nanoparticles Fe3O4 by coprecipitation method. This study also aims to determine the effect of heating time of iron sand extract on HCl solution on lattice parameters, crystal structure, nanoparticle size, surface morphological structure, chemical composition and magnetic properties of synthesized magnetite nanoparticles Fe3O4 by coprecipitation method.

The research included three stages, namely the extraction stage of iron sand from Glagah Kulon Progo beach sand, the synthesis stage of magnetite nanoparticles Fe3O4 by the coprecipitation method and the characterization stage of Fe3O4 magnetite nanoparticles. Characterization includes XRD (X-Ray Difraction), SEM (Scanning Electron Microscopy) and EDS (Energy Dispersive X-Ray Spectroscopy), and VSM (Vibrating Sample Magnetometer).

Based on the XRD results, Fe3O4 magnetite nanoparticles form crystals in the treatment with the dissolution temperature of iron sand extract at 45ºC and 50 ° C and form amorphous at dissolution temperatures of 55ºC and 60ºC with 1 hour dissolution time. Whereas at the dissolution temperature of 55ºC with dissolution time of 30 minutes, 45 minutes, 60 minutes and 75 minutes formed magnetic FeoO4 nanoparticles with almost the same lattice parameter values ??and the same crystal structure. Based on the results of SEM characterization, the formed Fe3O4 magnetic nanoparticles are quite homogeneous, which are characterized by grain sizes that are almost uniform and of the same color. Samples with dissolution temperature of 50 ºC and dissolution time of 60 minutes formed Fe3O4 nanoparticles with an average grain size of 0.482 µm. Samples with a dissolution temperature of 55ºC and a dissolution time of 75 minutes formed Fe3O4 nanoparticles with an average grain size of 193,861 nm. Based on the results of the VSM test it was found that Fe3O4 nanoparticles with a dissolution temperature of 55oC for 75 minutes had saturation magnetization value (Ms) of 31.0 emu / gram. Whereas for Fe3O4 nanoparticles with a dissolution temperature of 50oC for 60 minutes, the magnetic domain has not been saturated when subjected to 1T external magnetic field. The value of remanent magnetization (Mr) and coercivity field (Hc) for Fe3O4 nanoparticles with a dissolution temperature of 55oC for 75 consecutive minutes 9.6 emu / gram and 0.02 T. Whereas Fe3O4 nanoparticles with a dissolution temperature of 50oC for 60 minutes obtained Mr and Hc values ??respectively at 6.7 emu / gram and 0.03 T. This indicates that Fe3O4 nanoparticles are produced is a ferrimagnetic material. The coercivity value obtained from the two samples is smaller than 0.03 T, so it can be stated that the two nanoparticle samples are soft magnetic

Kata Kunci: *iron sand, nanoparticles, magnetite, coprecipitation*