PENGARUH WAKTU PENGADUKAN DAN SUHU KALSINASI TERHADAP PEMBENTUKAN DAN KARAKTER $NiFe_2O_4$ YANG DISINTESIS MENGGUNAKAN PASIR BESI SEBAGAI SUMBER Fe

SKRIPSI SARJANA KIMIA

Oleh:

NADYA . P . SINAGA

NIM: 2110413015

Dosen Pembimbing I: Prof. Dr. Rahmayeni, M.Si

Dosen Pembimbing II: Prof. Dr. Zulhadjri, M.Eng

PROGRAM SARJANA

DEPARTEMEN KIMIA

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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ABSTRACT

THE EFFECT OF STIRRING TIME AND CALCINATION TEMPERATURE ON THE FORMATION AND CHARACTERISTICS OF $NiFe_2O_4$ SYNTHESIZED USING IRON SAND AS Fe SOURCE

by:

Nadya P. Sinaga (NIM: 2110413015)
Prof. Dr. Rahmayeni, M.Si and Prof. Dr. Zulhadjri, M.Eng

Along with the advancement of technology, the development of nanomagnetic materials based on spinel ferrites has gained increasing attention due to their wide potential applications in various fields of science and technology. Nickel ferrite ($NiFe_2O_4$) material has become the main focus of this research because of its superior structural, magnetic, and electrical properties, which support its application in high-tech devices. In this study, $NiFe_2O_4$ was synthesized using iron sand from Kata Beach, Pariaman as the Fe source through the coprecipitation method with variations in calcination temperature and stirring time during the synthesis process to investigate the morphology as well as the optical, magnetic, and electrical properties of the obtained material. The utilization of iron sand as a raw material in this synthesis also demonstrates the potential added value of local natural resources for the development of functional materials with advanced technological applications. The synthesized nanomaterials were characterized using XRD, FTIR, VSM, SEM-EDX, UV-Vis DRS and LCR meter. X-Ray Diffraction (XRD) data confirmed that all ferrite samples possessed a crystal structure with space group Fd-3m. Fourier Transform Infrared (FT-IR) analysis identified characteristic vibrations at wavenumbers 600–550 cm^{-1} for tetrahedral sites and 500–450 cm^{-1} for octahedral sites. Scanning Electron Microscopy (SEM) results showed that the surface morphology of the samples changed according to the variation in calcination temperature. Diffuse Reflectance Spectroscopy (DRS) UV-Vis analysis revealed that $NiFe_2O_4$ could absorb light in the visible region with a bandgap value ranging from 1,53 to 1,54 eV. The VSM analysis revealed that $NiFe_2O_4$ exhibits soft magnetic behavior with increasing Ms, Mr, and Hc values as the calcination temperature rises. Furthermore, the dielectric constant was found to decrease with increasing frequency, indicating that $NiFe_2O_4$ has potential applications in magnetic field sensors, and as a promising magnetoelectric material.

Keywords: *$NiFe_2O_4$, iron sand, coprecipitation, stirring time, calcination, magnetic properties, dielectric properties*