

INTISARI

Analisa Struktur Kristal dan Gugus Fungsi pada *Magnetic Nanoparticles* (MNPs) *Cobalt Zinc Ferrite* ($\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$) yang Dienkapsulasi dengan Silika (SiO_2)

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Nanopartikel $\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$ telah berhasil disintesis dengan menggunakan metode kopresipitasi pada suhu 70°C dan dienkapsulasi dengan perkusor *sodium silicate solution* (Na_2SiO_3) pada berbagai konsentrasi. Hasil dari *X-Ray Diffraction* (XRD) menunjukkan adanya fasa kubik spinel ferit pada nanopartikel $\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$ dengan ukuran kristalit ($17,0 \pm 0,1$) nm. Setelah dilakukan enkapsulasi natrium silikat menunjukkan adanya fasa baru SiO_2 dan ukuran kristalit menjadi ($14,8 \pm 0,1$) nm dan ($17,1 \pm 0,2$) nm untuk konsentrasi silika 10% dan 50% berturut-turut. Hasil *Transmission Electron Microscopy* (TEM) menunjukkan aglomerasi dari nanopartikel berkurang setelah dienkapsulasi *Sodium Silicate*. Analisis gugus fungsi dilakukan menggunakan *Fourier Transform Infra Red* (FTIR). Spektrum FTIR menunjukkan adanya ikatan vibrasi $\text{M} - \text{O}_{\text{oct}}$ di sekitar $408 - 471 \text{ cm}^{-1}$ dan $\text{M}_{\text{tet}} - \text{O}$ di sekitar $586,4 \text{ cm}^{-1}$. Setelah dilakukan enkapsulasi natrium silikat muncul ikatan vibrasi baru khas silika berupa $\text{Si} - \text{O} - \text{Si}_{\text{asymmetric}}$ sekitar $1041,5 \text{ cm}^{-1}$.

Kata kunci: nanopartikel magnetik *Cobalt Zinc Ferrite* ($\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$), kopresipitasi, enkapsulasi, *sodium silicate solution* (Na_2SiO_3)

ABSTRACT

Crystal Structure and Functional Group Analysis of Silica (SiO_2) Encapsulated Cobalt Zinc Ferrite ($\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$) Magnetic Nanoparticles (MNPs)

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Cobalt Zinc Ferrite nanoparticles has been successfully synthesized using coprecipitation method at $70\text{ }^{\circ}\text{C}$ and encapsulated by Sodium Silicate Solution (Na_2SiO_3) with various concentrations. X-Ray Diffraction (XRD) patterns showed that nanoparticles contained $\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$ cubic spinel ferrite with crystallites size of $(17,0 \pm 0,1)\text{ nm}$. After sodium silicate encapsulation, the new phase of SiO_2 appeared and the crystallites size becomes $(14,8 \pm 0,1)\text{ nm}$ and $(17,1 \pm 0,2)\text{ nm}$ for concentration 10% and 50% respectively. Transmission Electron Microscopy (TEM) showed decreasing agglomeration after sodium silicate encapsulation. Bonding analysis of functional groups was performed using Fourier Transform Infra Red (FTIR). FTIR spectra showed that bond vibration of $\text{M} - \text{O}_{\text{Oct}}$ is around $408 - 471\text{ cm}^{-1}$ and $\text{M}_{\text{tet}} - \text{O}$ is around $586,4\text{ cm}^{-1}$. After sodium silicate encapsulation, there are a new bond vibration typical of silica like $\text{Si} - \text{O} - \text{Si}_{\text{asymetric}}$ around $1041,5\text{ cm}^{-1}$.

Keywords: magnetic nanoparticles Cobalt Zinc Ferrite ($\text{Co}_{0,5}\text{Zn}_{0,5}\text{Fe}_2\text{O}_4$), coprecipitation, encapsulation, Sodium Silicate Solution (Na_2SiO_3)