

## INTISARI

### Karakterisasi dan Analisa Gugus Fungsi pada *Magnetic Nanoparticles* (MNPs) *Zinc Nickle Ferrite* ( $Zn_{0,5}Ni_{0,5}Fe_2O_4$ ) yang Dientkapsulasi dengan Silika ( $SiO_2$ )

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Nanopartikel  $Zn_{0,5}Ni_{0,5}Fe_2O_4$  telah berhasil disintesis dengan menggunakan metode kopresipitasi dan dienkapsulasi dengan prekursor natrium silikat ( $Na_2SiO_3$ ) pada berbagai konsentrasi. Hasil dari *X-Ray Diffraction* (XRD) menunjukkan adanya fasa spinel ferit pada nanopartikel  $Zn_{0,5}Ni_{0,5}Fe_2O_4$  dengan ukuran kristalit ( $13,8 \pm 0,1$ ) nm. Setelah dilakukan enkapsulasi natrium silikat menunjukkan adanya fasa baru  $SiO_2$  dan ukuran kristalit menjadi ( $13,0 \pm 0,1$ ) nm. Hasil *Transmission Electron Microscopy* (TEM) menunjukkan aglomerasi dari nanopartikel berkurang. Analisis gugus fungsi dilakukan menggunakan *Fourier Transform Infra Red* (FTIR). Spektrum FTIR menunjukkan adanya ikatan vibrasi M-O<sub>oct</sub> di sekitar  $398,7 - 416,6 \text{ cm}^{-1}$  dan M-O<sub>tet</sub> disekitar  $578,6 - 586,4 \text{ cm}^{-1}$ . Setelah dilakukan enkapsulasi natrium silikat muncul ikatan vibrasi baru khas silika berupa Si-O-Si<sub>asymmetric</sub> ( $1087,8 \text{ cm}^{-1}$ ) dan Si-OH ( $3487,3 \text{ cm}^{-1}$ ).

**Kata kunci:** nanopartikel magnetik *Zinc Nickel Ferrite* ( $Zn_{0,5}Ni_{0,5}Fe_2O_4$ ), kopresipitasi, enkapsulasi, natrium silikat ( $Na_2SiO_3$ )

## ABSTRACT

### **Characterization and Functional Group Analysis of Silica ( $SiO_2$ ) Encapsulated Zinc Nickle Ferrite ( $Zn_{0,5}Ni_{0,5}Fe_2O_4$ ) Magnetic Nanoparticles (MNPs)**

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Zinc Nickel Ferrite nanoparticles has been successfully synthesized using coprecipitation method and encapsulated by Sodium Silicate Solution ( $Na_2SiO_3$ ) with various concentrations. X-Ray Diffraction (XRD) patterns showed that nanoparticles contained  $Zn_{0,5}Ni_{0,5}Fe_2O_4$  spinel ferrite with crystallites size of  $(13,8 \pm 0,1)$  nm. After sodium silicate encapsulation, the new phase of  $SiO_2$  appeared and the crystallites size became  $(13,0 \pm 0,1)$  nm. 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  $M-O_{oct}$  is around  $398,7 - 416,6 \text{ cm}^{-1}$  and  $M-O_{tet}$  is around  $578,6 - 586,4 \text{ cm}^{-1}$ . After sodium silicate encapsulation, there are a new bond vibration typical of silica like  $Si-O-Si_{asymmetric}$  ( $1087,8 \text{ cm}^{-1}$ ) dan  $Si-OH$  ( $3487,3 \text{ cm}^{-1}$ ).

**Keywords:** magnetic nanoparticles Zinc Nickel Ferrite ( $Zn_{0,5}Ni_{0,5}Fe_2O_4$ ), coprecipitation, encapsulation, Sodium Silicate Solution ( $Na_2SiO_3$ )