INTISARI

KAJIAN SIFAT OPTIK PADA NANOPARTIKEL *BISMUTH FERRITE*/SILIKA ($BiFeO_3/SiO_2$)

Oleh

Aulia Tataning Nuswantari

(18/430209/PA/18722)

Telah dilakukan sintesis $BiFeO_3/SiO_2$ dengan konsentrasi SiO_2 sebesar 0%, 5%, 10%, 15%, dan 20%. $BiFeO_3/SiO_2$ disintesis menggunakan metode kopresipitasi dan dikarakterisasi menggunakan *X-Ray Diffractometer* (XRD), spektroskopi impedansi terkomputerisasi mengukur sifat dielektriknya, dan mengukur energi *gap* menggunakan spektroskopi UV-Vis. Analisis kristal $BiFeO_3/SiO_2$ menghasilkan fase kristal $BiFeO_3$, $Bi_{25}FeO_{40}$ dan $Bi_2Fe_4O_9$, serta fase silika *amorphous* dengan $Bi_{25}FeO_{40}$ merupakan fase utama. Ukuran kristalit menurun dari 37,3±0,2 nm menjadi 22,5±0,3 nm. Nilai permitivitas dielektrik (riil dan imajiner) dan *loss tangent* meningkat setelah dienkapsulasi. Nilai permitivitas dielektrik riil dan imajiner terbesar dimiliki oleh sampel konsentrasi SiO_2 15% dan 20% yaitu 9,32±0,06 dan 2,16±0,06. Nilai loss tangent terbesar dimiliki oleh sampel konsentrasi SiO_2 20% sebesar 0,537±0,004. Energi celah pita langsung tertinggi sebesar 2,7±0,1 eV oleh sampel konsentrasi SiO_2 15% dan energi celah pita tak langsung tertinggi sebesar 1,5±0,1 eV oleh sampel konsentrasi SiO_2 20%.

Kata kunci: nanopartikel $BiFeO_3$, silika, sifat dielektrik, energi gap.

ABSTARCT

STUDY OF OPTICAL PROPERTIES IN *BISMUTH FERRITE*/SILICA NANOPARTICLES ($BiFeO_3/SiO_2$)

Oleh
Aulia Tataning Nuswantari
(18/430209/PA/18722)

$BiFeO_3/SiO_2$ synthesis has been carried out with SiO_2 concentrations of 0%, 5%, 10%, 15%, and 20%. $BiFeO_3/SiO_2$ was synthesized using the coprecipitation method and characterized using X-Ray Diffractometer (XRD), computerized impedance spectroscopy to measure its dielectric properties, and to measure the energy gap using UV-Vis spectroscopy. Analysis of the crystals of $BiFeO_3/SiO_2$ resulted in the crystalline phases of $BiFeO_3$, $Bi_{25}FeO_{40}$ and $Bi_2Fe_4O_9$, as well as the amorphous silica phase with $Bi_{25}FeO_{40}$ as the main phase. The crystallite size decreased from 37.3±0.2 nm to 22.5±0.3 nm. The value of dielectric permittivity (real and imaginary) and loss tangent increase after encapsulation. The largest real and imaginary dielectric permittivity values were obtained by the 15% and 20% SiO_2 concentration samples, namely 9.32±0.06 and 2.16±0.06, respectively. The largest loss tangent value was owned by the 20% SiO_2 concentration sample of 0.537 ± 0.004. The highest direct band gap energy was 2.7±0.1 eV by the 15% SiO_2 concentration sample and the highest indirect bandgap energy was 1.5±0.1 eV by the 20% SiO_2 concentration sample.

Keywords: $BiFeO_3$ nanoparticles, silica, dielectric properties, gap energy.