

ABSTRAK

**PENGARUH PENAMBAHAN *GRAPHITE* TERHADAP
KARAKTERISTIK GUGUS FUNGSI, FASA DAN SIFAT LISTRIK PADA
BAHAN KATODE $\text{Na}_2\text{FeSiO}_4$**

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Penelitian ini bertujuan untuk menganalisis pengaruh penambahan grafit terhadap gugus fungsi $\text{Na}_2\text{FeSiO}_4$ dan menganalisis pengaruh variasi komposisi polianion $\text{Na}_2\text{FeSiO}_4/\text{C}$ terhadap gugus fungsi, fasa kristal, dan sifat listrik katode baterai. Sampel dibuat dari NaOH , $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, SiO_2 dari sekam padi dan $\text{C}_6\text{H}_8\text{O}_7 \cdot \text{H}_2\text{O}$ menggunakan metode sol gel. Sampel disintering pada suhu $800\text{ }^\circ\text{C}$ dengan kenaikan suhu $3\text{ }^\circ\text{C}$ tiap menit dan waktu tahan 10 jam. Gugus fungsi dari masing-masing sampel diidentifikasi menggunakan *Spektroskopi Fourier Transform Infra Red* (FTIR), dan fasanya diidentifikasi menggunakan difraksi sinar-X (XRD) ditambah dengan analisis kualitatif dan kuantitatif. Sedangkan *band gap* dan konduktivitas listrik dikarakterisasi dengan Uv-Vis dan LCR meter. Spektrum FTIR mengidentifikasi gugus fungsi Na-O, Fe-O, dan Si-O dari struktur NaO_4 , FeO_4 , dan SiO_4 tetrahedral. Analisis XRD didominasi oleh fasa $\text{Na}_2\text{FeSiO}_4$ dan diikuti oleh fasa lain yaitu FeSiO_3 , SiO_2 , dan C. Nilai energi *band gap* menurun seiring meningkatnya nilai konduktivitas listrik yang dihasilkan, hal ini dipengaruhi oleh adanya penambahan bahan grafit. Grafit bersifat konduktor yang nilai *bandgap*-nya dibawah $0,5\text{ eV}$ dan memiliki konduktivitas listrik $\sim 10^4\text{ S/m}$, hal tersebut yang membuat energi *band gap*-nya menurun dan konduktivitasnya meningkat.

Kata kunci: Energi *band gap*, gugus fungsi, konduktivitas listrik, fasa kristal, Grafit, $\text{Na}_2\text{FeSiO}_4$, silika sekam padi

ABSTRACT

**THE EFFECT OF ADDITION OF GRAPHITE ON THE
CHARACTERISTICS OF FUNCTIONAL GROUP, PHASE AND
ELECTRICAL PROPERTIES IN CATHODE MATERIALS Na₂FeSiO₄**

By

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This study aims to analyze the effect of adding graphite to the Na₂FeSiO₄ functional group and to analyze the effect of variations in the composition of the Na₂FeSiO₄/C polyanion on functional groups, crystal phase, and the electrical properties of the battery cathode. Samples were prepared from NaOH, Fe(NO₃)₃·9H₂O, SiO₂ from rice husks, and C₆H₈O₇·H₂O using the sol-gel method. Samples were sintered at 800 °C with a temperature increase of 3 °C every minute and a holding time of 10 hours. The functional groups of each sample were identified using Fourier Transform Infra-Red (FTIR) Spectroscopy, and the phases were identified using X-Ray Diffraction (XRD) coupled with qualitative and quantitative analysis. Meanwhile, band gap and electrical conductivity were characterized by Uv-Vis and LCR meters. The FTIR spectrum identified the Na-O, Fe-O, and Si-O functional groups from the NaO₄, FeO₄, and SiO₄ tetrahedral structures. The XRD analysis was dominated by the Na₂FeSiO₄ phase followed by other phases, namely FeSiO₃, SiO₂, and C. The value of the band gap energy decreased as the resulting electrical conductivity value increased, this was influenced by the addition of graphite. Graphite is a conductor whose band gap value is below 0.5 eV and has an electrical conductivity of ~10⁴ S/m, this causes the band gap energy to decrease and the conductivity to increase.

Keywords: Band gap energy, functional groups, electrical conductivity, crystalline phase, Graphite, Na₂FeSiO₄, rice husk silica.