

SYNTHESIS AND CHARACTERIZATION OF Co and Ni DOPED LiFePO₄/C USING MICROWAVE REFLUX-IRRADIATION METHOD

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ABSTRACT

The aims of this study were (1) to determine the physical characteristics (particle size, morphology, microstructure) of Co and Ni-doped LiFePO₄/C using the reflux-microwave irradiation method; (2) To determine the conductivity of Co and Ni-doped LiFePO₄/C by reflux-microwave irradiation method.

This research developed the synthesis of Co and Ni doped LiFePO₄/C by reflux method assisted by microwave irradiation. The variables studied in this study were the quantity and type of dopant. Quantity and type of dopants greatly affect the character of the synthesized product which includes purity, type of phase, structural stability and crystallinity, so that techniques and controls are needed for these factors. The characterization of the synthesized Co and Ni-doped LiFePO₄/C was analyzed by XRD, SEM-EDX, and conductivity tests. The microstructure characterization was carried out using the U-Fit program.

The results showed that Co and Ni doped LiFePO₄/C compounds could be synthesized using reflux-microwave irradiation method with 2 reaction steps. The results of data analysis showed that the Co and Ni doped LiFePO₄/C compounds have an orthorhombic crystal system with *Pnma* space group. However, the results obtained are not pure as can be seen from the presence of other phases. As the value of mole x of Co and Ni doped LiFePO₄/C increases, the lattice parameter values (a, b, c), crystal volume and crystal size decrease. The lattice parameters of Co and Ni doped LiFePO₄/C compounds decreased with increasing moles of doping given in the range $a = 10.4002 - 10.4477$ Å, $b = 6.0684 - 6.1095$ Å, $c = 4.7054 - 4.7519$ Å and a volume in the range of 300.0177–302.3368 Å³. The addition of the mole x ratio causes a decrease in the crystal size in the range of 16.5 nm – 21.6 nm. The results of SEM–EDX analysis showed that the surface of the LiFePO₄, LiFe_{0.75}Co_{0.25}PO₄ and LiFe_{0.93}Ni_{0.07}PO₄ compounds was irregular with non-uniform size. From the research, it is hoped that manuscripts can be published in Scopus indexed international journals, Science Sintering (Q2)

Kata Kunci: *LiFePO₄/C, doping Co dan Ni, reflux-microwave irradiation method, orthorhombic, Pnma*