

## Performance of vanadium-doped $\text{LiFePO}_4/\text{C}$ used as a cathode for a lithium ion battery

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Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=20449317&lokasi=lokal>

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### Abstrak

Vanadium-doped  $\text{LiFePO}_4/\text{C}$

used as a cathode for a lithium ion battery has been successfully synthesized.

In this work,  $\text{LiFePO}_4$  was synthesized from  $\text{LiOH}$ ,  $\text{NH}_4\text{H}_2\text{PO}_4$ ,

and  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  at a stoichiometric amount. Vanadium was added in the

form of  $\text{H}_4\text{NO}_3\text{V}$  at concentration variations and 3 wt. %

carbon black. The characterization includes thermal analysis, X-ray

diffraction, electron microscopy, and electrical impedance spectroscopy. The

thermal analysis results showed that the  $\text{LiFePO}_4$  formation

temperature is  $653.8 \pm 700.0^\circ\text{C}$ . The X-ray

diffraction results showed an olivine structure with an orthorhombic space

group, whereas the electron microscopy results showed that  $\text{LiFePO}_4/\text{C}$

has a round shape with an agglomerated microstructure. Electrical impedance

test results showed values of  $158 \pm 937$ ; and  $59 \pm 937$ ; for the as-synthesized

$\text{LiFePO}_4/\text{C}$  and the 5 wt. % vanadium-doped

$\text{LiFePO}_4/\text{C}$ , respectively. Cyclic performance test results at 1 C

showed capacities of 24.0 mAh/g and 31.2 mAh/g for the as-synthesized  $\text{LiFePO}_4/\text{C}$

and the 5 wt. % vanadium-doped  $\text{LiFePO}_4/\text{C}$ ,

respectively. Charge and discharge test results showed charge and discharge

capacities of 27.6 mAh/g and 40.2 mAh/g for the as-synthesized  $\text{LiFePO}_4/\text{C}$  and the 5 wt. %

vanadium-doped  $\text{LiFePO}_4$ , respectively. This result is promising

in terms of increasing the performance of a lithium ion battery.