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Synthesis and Characterization of High-Quality Polycrystalline Sample NiV_2O_6 by Solid-State Reaction Technique

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Received: November 11, 2019

Revised: January 30, 2020

Accepted: February 2, 2020

Employing the solid-state reaction route, good quality polycrystalline sample NiV_2O_6 is prepared that has effective application in rechargeable Li-ion batteries. The raw materials NiO and V_2O_5 (purity > 99%) were used for the fabrication of NiV_2O_6 . The phase formation and thermal stability of this sample were measured by thermogravimetric analyzer. The micro-structural feature of this sample was measured by scanning electron microscopy (SEM). The SEM images ensured that the product NiV_2O_6 is very uniform and well-separated and consists of large grain size of about 1–5 μm . The crystal structure and bonding characteristics of NiV_2O_6 were obtained by XRD diffractometer and FTIR spectroscopy. The X-ray diffraction data revealed the triclinic structure of NiV_2O_6 with space group P-1 and lattice parameters: $a = 7.162 \text{ \AA}$, $b = 8.816 \text{ \AA}$, $c = 4.789 \text{ \AA}$, and axial angles $\alpha = 90.13^\circ$, $\beta = 93.78^\circ$, and $\gamma = 101.72^\circ$. The temperature-dependent electrical resistivity of NiV_2O_6 was measured by two-probe method which ensured the semiconducting nature of this phase. The electronic and optical properties were investigated by impedance analyzer and UV-Visible spectrophotometer. The calculated optical band gap of NiV_2O_6 is found to be 2.38 eV.

Keywords: crystal morphology, XRD, SEM, FTIR, electronic properties, optical properties.