Sintesis life1-0.5mn0.5po4/v/c dengan variasi kondisi keasaman prekursor garam besi dan aplikasinya sebagai katode baterai ion litium = Synthesis of life1-0.5mn0.5po4/v/c at various iron salt precursor acid conditions and its performance for lithium ion battery cathode

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Abstrak

ABSTRAK
Sintesis LiFe1-0.5Mn0.5PO4/V/C sebagai katode baterai ion litium telah berhasil dilaksanakan. Material LiFe1-0.5Mn0.5PO4/V/C disintesis dengan prekursor intermediat garam besi yang terdiri dari FeSO4.7H2O, dan NH4H2PO4, prekursor LiOH, prekursor MnSO4.H2O, prekursor NH4VO3, serta prekursor C6H8O7. Prekursor intermediat garam besi disintesis dengan variasi kondisi pH meliputi suasana asam (pH 2), netral (pH 7), dan basa (pH 10), metode pemanasan yang digunakan, serta penambahan perlakuan ultrasonik. Hasil penelitian menunjukkan bahwa kondisi pH sintesis akan mempengaruhi morfologi serta struktur kristal senyawa intermediat yang dihasilkan. Morfologi partikel dari seri asam cenderung berbentuk bulat ataupun oktahedral, seri netral cenderung berbentuk persegi panjang, sementara dari seri basa cenderung berbentuk lembaran. Struktur kristal seri asam menyerupai mineral lipscombite, sedangkan struktur kristal seri netral dan basa memiliki struktur garam besi fosfat. Perlakuan ultrasonik juga memberikan pengaruh terhadap morfologi serta struktur kristal senyawa intermediat yang dihasilkan. Morfologi dari sampel yang dikenai perlakuan ultrasonik cenderung berbentuk oktahedral, sementara durasi perlakuan ultrasonik mempengaruhi ukuran kristalit material. Proses pemanasan mempengaruhi morfologi serta struktur kristal senyawa intermediat yang dihasilkan. Proses pemanasan tanpa metode hidrotermal menghasilkan partikel yang cenderung beragregat. Hasil pengujian memperlihatkan sampel katode yang memiliki konduktivitas optimum didapatkan dari sampel LiFe1-0.5Mn0.5PO4/V/C yang disinter dengan tube furnace sebesar 5.6870 x10-5 S.cm-1, dengan tegangan kerja serta kapasitas pengisian optimum dalam sistem baterai R2032 dengan susunan [Li|1 M LiPF6/EC-DMC| LiFe1-0.5Mn0.5PO4/V/C] masing-masingnya 4.7 V dan 5.6 mAh.g-1.
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ABSTRACT
Synthesis and characterization of LiFe1-0.5Mn0.5PO4/V/C used as lithium ion battery cathode has been successfully conducted. The LiFe1-0.5Mn0.5PO4/V/C composite was synthesized using iron salt intermediate precursors, which consist of FeSO4.7H2O, and NH4H2PO4, LiOH precursor, MnSO4.H2O precursor, NH4VO3 precursor and C6H8O7 precursor. Iron salt intermediate precursors were synthesized at various variable including variations in pH conditions acidic atmosphere (pH 2), neutral (pH 7), and alkaline (pH 10), heat treatments, and the use ultrasonic treatment. The results show that the pH synthesis conditions affect the morphology and crystal structure of the intermediate compounds produced. The morphology of iron salt intermediates in acidic condition was round and octahedral, in neutral condition is rectangular, and in alkaline condition is in sheet form. The crystal in acidic condition favored lipscombite structures, while the neutral and alkaline conditions favored phosphate iron salt structure. The ultrasonic treatment affected morphology and crystal structure of the intermediate compounds produced. The samples subjected to

ultrasonic treatment formed an octahedral structure. Heat treatment also affected the morphology and crystal structural of the intermediate compounds produced. Heat treatment without hydrothermal treatment produced aggregated particles. In this work, the best conductivity of the cathode was obtained from LiFe1-0.5Mn0.5PO4/V/C sintered with tube furnace at 5.6870 x10-5 S.cm-1 and a working voltage and charge discharge in R2032 coin cell battery [Li|1 M LiPF6/EC-DMC| LiFe1-0.5Mn0.5PO4/V/C] of 4.7 V and 5.6 mAh.g-1, respectively.