Sintesis komposit Li4Ti5O12 dan Sn untuk anoda baterai lithium ion dengan metode hidrotermal = Synthesis of Li4Ti5O12 and Sn composite for lithium ion battery anode with hydrothermal method

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Abstrak

[Komposit Li4Ti5O12 dan Sn untuk material anoda baterai lithium-ion dipreparasi dengan 2 rute, yaitu sintesis Li4Ti5O12 (LTO) dengan metode hidrotermal dan mixing LTO dan Sn menggunakan ball mill. Tujuan dari penelitian ini adalah untuk memperoleh suhu kalsinasi yang optimum pembentukan fasa spinel LTO serta penambahan berat serbuk Sn yang tepat untuk memperoleh peningkatan performa LTO. Sampel dikarakterisasi menggunakan DT/TGA, XRD, SEM EDX, dan EIS. Sedang properti elektrokimia dianalisis menggunakan tes charge/discharge battery analyzer. Hasil menunjukkan telah terbentuk fasa spinel LTO dan butir tumbuh 17, 20, dan 40 nm masing-masing untuk suhu kalsinasi 500, 600, dan 700oC. Foto SEM memperlihatkan butir-butir berbusa dan mengalami aglomerasi yang merupakan efek dari proses sintesis hidrotermal. Dari penelitian ini diperoleh sampel komposit LTO 500oC dan Sn 10% dengan nilai konduktivitas tertinggi yaitu 9,06 x 10-7 S/cm. Uji cyclic voltammetry menunjukkan pasangan anodik-katodik tegangan reduksi-oksidasi LTO 1,5 dan 1,7 V, serta 1,71 dan 2,11 V untuk TiO2. Sedangkan tegangan litiasi Sn terdeteksi0,61 V. Untuk uji charge/discharge komposit LTO 500oC dan Sn 10% memperlihatkan penambahan Sn akan memberi keuntungan saat tegangan rendah (0,6 V) yaitu komposit masih memiliki kapasitas. Kapasitas spesifik untuk komposit LTO 500oC dan Sn 10% mencapai 110 mAh/g dengan C/3.;Li4Ti5O12 and Sn composites as anode material for lithium-ion battery have been prepared with two routes, ie. synthesis of Li4Ti5O12 (namely LTO) with hydrothermal method and mixing LTO and Sn using mechanical ball milling method. The purposes of this study are to obtain the optimum calcination temperatures LTO spinel phase formation and the precise addition of Sn powder is to obtain the improved performance of LTO. Samples have been characterized by DT/TGA, XRD, SEM EDX, and ElS. Meanwhile, electrochemical properties were analyzed using a charge-discharge test battery analyzer. Results showed that LTO spinel phase has been formed and the grains growth 17, 20, and 40 nm respectively for calcination temperature 500, 600, and 700°C. SEM photograph showing a grain foaming and run into agglomeration which is the effect of hydrothermal synthesis process. From this study, LTO 500oC and 10%Sn composite has the highest conductivity value ie 9.06 x 10-7 S/cm. Test cyclic voltammetry showed a couple of anodic-cathodic reduction-oxidation voltage LTO 1.48 and 1.74 V, and 1.65 and 2.11 V for TiO2. Lithiation voltage for Sn at 0.61 V. For test charge/discharge LTO 500oC and 10%Sn composite showed the addition of Sn will benefit current low voltage (0.6 V) is a composite still has capacity. Specific capacity for LTO 500oC and 10%Sn composite up to 110 mAh/g with C/3.;Li4Ti5O12 and Sn composites as anode material for lithium-ion battery have been prepared with two routes, ie. synthesis of Li4Ti5O12 (namely LTO) with hydrothermal method and mixing LTO and Sn using mechanical ball milling method. The purposes of this study are to obtain the optimum calcination temperatures LTO spinel phase formation and the precise addition of Sn powder is

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