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Karakteristik bahan anoda baterai NiMH (LaNi5) setelah penambahan serium oksida (CeO2) dan proses anil = Characteristic of anode materials lani5 for (NiMH) battery after addition of cerium oxide (CeO2) and annealing process / Ade Utami Hapsari

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Abstrak

ABSTRAK
Senyawa metal alloy (LaNi5) biasa digunakan untuk anode baterai Nickel-Metal Hydride (NiMH) karena mampu mengabsorpsi hidrogen dan dapat beroperasi pada kondisi tekanan dan temperatur ruang. Ketika oksida logam tanah jarang ditambahkan ke dalam anode sel baterai NiMH, tidak hanya charge efficiency dan capacity-retention yang akan meningkat, tetapi juga menjadi rapid charge dan high power cycling. Penelitian dilakukan untuk melihat karakteristik bahan anode LaNi5 setelah penambahan CeO2 dan proses anil. Metode yang digunakan adalah mechanical alloying dengan mencampur serbuk LaNi5 dengan serbuk CeO2 sebanyak 1%, 2%, dan 3% berat di dalam ball mill selama 120 menit pada putaran 240 rpm. Setelah itu, dilakukan proses anil pada temperatur 300°C, 600°C, dan 900°C selama 6 jam di lingkungan gas argon. Kemudian, serbuk dikarakterisasi dengan menggunakan XRD, SEM-EDX, dan BET. Pengujian elektrokimia dilakukan dengan menggunakan Electrochemical Impedance Spectroscopy (EIS) pada frekuensi 5 mHz ? 100 kHz. Penambahan konsentrasi CeO2 diatas 2%, akan memperkecil volume cell dan mengecilkan diameter pori. Konduktivitas tertinggi yang dicapai pada penelitian ini adalah sebesar 1.5332 S/cm dengan diameter pori 0.0082 cc/g. Walaupun penambahan konsentrasi CeO2 ke dalam material anode meningkatkan tahanan material, tetapi penambahan 1% CeO2 dapat meningkatkan ketahanan korosi material anode dengan Ecorr sebesar -0.6432 V. Peningkatan temperatur anil menyebabkan perubahan difraksi fasa menjadi fasa NiO dan La2O3 yang menyebabkan konduktivitas menurun dan nilai tahanan semakin besar.
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ABSTRACT
A Lanthanum Nickel compound (LaNi5) is widely used for an anode of Nickel-Metal Hydride (NiMH) battery due to excellence on hydrogen absorption and good capability to be operated at room temperature and pressure condition. Addition of rare earth oxide to the NiMH has increase charge-retention efficiency and capacity also has both rapid charge and high power cycling. The experiment has been conducted to observe the characteristic of the anode LaNi5 materials after addition of CeO2 and annealing. As method of this experiment, mechanical alloying was done by mixed LaNi5 and CeO2 powder which had 1%, 2% and 3%

weight mass in ball mill for 120 minutes at 240 rpm. After that, the annealing was carried out at varied temperature, 300°C, 600°C and 900°C for 6 hours in argon gas exposure. Then the powders were characterized with XRD, SEM-EDX, and BET. Electrochemical Impedance Spectroscopy (EIS) was used for electrochemical testing on the frequency between 5 mHz - 100 kHz. The results of this experiment show that increasing CeO2 more than 2% concentration lead to decrease the volume of cells and the pore diameter. Furthermore, this is affect the value of ionic conductivity with the highest conductivity is 1.5332 S / cm and 0.0082 cc / g in diameter pore. Although the addition of CeO2 concentration into the anode material increases the resistance, the addition of 1% CeO2 can improve the corrosion resistance of the anode material with Ecorr of -0.6432 V. In conclusions, annealing temperature increasing will changes diffraction phase with the dominant phase NiO and La2O3, thus the conductivity was decreasing and the resistance was increasing.