

# Meningkatkan Performa Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> dengan Doping Bubuk Nickel melalui Metode Solid State sebagai Sel Anoda Baterai Lithium ion = Enhancing Performance of Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> with Nickel Powder Doping by Solid-State Method as Half-Cell Lithium-ion Battery Anode

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## Abstrak

Litium Titanat, Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> (LTO) adalah kandidat yang menjanjikan sebagai bahan anoda baterai lithium ion. Dalam penelitian ini, Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> akan disintesis dengan menggunakan metode solid-state dengan menggunakan komersial TiO<sub>2</sub> dan komersial litium hidroksida (LiOH). Setelah itu, komersial bubuk nikel dipanaskan pada suhu 600oC selama 4 jam untuk mendapatkan NiO sebagai logam oksida transisi. Penambahan NiO ke LTO kepada semua sampel sebesar 3%. Tiga variasi penambahan lama waktu proses sintering sebesar 4 jam, 8 jam, 10 jam, diberi label sampel LTO/NiO 3% (4 jam), LTO/NiO 3% (8 jam) and LTO/NiO 3% (10 jam). Karakterisasi dilakukan menggunakan XRD dan SEM untuk mengamati efek penambahan NiO pada struktur dan morfologi sampel yang dibuat. Hasil karakterisasi sampel menunjukkan bahwa penambahan NiO 3% memiliki konduktivitas lebih baik. Hasil dari tes Electrochemical Impedance Spectroscopy juga menunjukkan LTO/NiO 3% (4 jam) memiliki konduktivitas terbaik dengan nilai resistansi terkecil

.....Lithium titanate, Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> (LTO) is a promising candidate as lithium ion battery anode material. In this investigation, Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> was synthesized with solid-state method by using TiO<sub>2</sub> with the help of lithium hydroxide (LiOH) and nickel powder as the precursor materials, resulting in LTO. Commercial nickel powder was heated at 600oC for 4 hours to obtain NiO as transition metal oxide. NiO addition to the LTO for all samples is 3% in weight%. Three variations of different sintering holding time for 4 hours, 8 hours and 10 hours labelled as LTO/NiO 3% (4 hours), LTO/NiO 3% (8 hours) and LTO/NiO 3% (10 hours), respectively. The characterizations were made using XRD and SEM testing. These were performed to observe the effect of NiO addition and different holding time on structure and morphology of the resulting samples. The result showed that the addition of NiO will make the samples have better conductivity. According to Electrochemical Impedance Spectroscopy, LTO/NiO 3% (4 hours) also has the best conductivity with the lowest resistivity.