Pengembangan lapisan tipis LiCoO2 berbasis np- LiCoO2+xPVDF sebagai bahan katoda pada baterai mikro = The development of LiCoO2 thin film based np-LiCoO2 + xPVDF as cathode material in micro battery

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Abstrak

Dewasa ini, pengembangan baterai sebagai bahan penyimpan energi yang tinggi, ringan, mampu pakai dalam jangka waktu yang lama, telah banyak dilakukan . Baterai berbasis ion lithium mampu menghasilkan energi yang besar, dan reservoir ion lithium pada baterai adalah elektroda. Pada penelitian ini elektroda yang dikembangkan adalah partikel nano LiCoO2 ditambahkan 5, 10, 15, 20 % v/v PVDF, sintesa partikel nano LiCoO2 dilakukan menggunakan teknik planetary milling dan ultra sonic. Partikel nano LiCoO2 + x PVDF, dikarakterisasi menggunakan SEM-EDX, XRD, TEM, PSA dan analisa konduktifitas. Pembentukan lapisan tipis katoda, Pt/np-LiCoO2+xPVDF/Pt dilakukan menggunakan metoda magnetron sputter deposition (MSD). Baterai mikro Si/Pt/LiCoO2/C6/Cu hasil pembentukan MSD dianalisa menggunakan metode SEM-EDX, XRD, analisa konduktifitas, Four Probe Analyzer. Hasil penelitian menunjukan bahwa, nano partikel LiCoO2 + 10 %v/v PVDF memiliki konduktifitas terbaik, memiliki struktur rhombohedral R-3m, dengan parameter kissi a = b = 2,8213 Å, c = 14,0446 Å. Lapisan tipis Pt/np-LiCoO2+10%v/vPVDF/Pt dibentuk menggunakan metoda MSD pada arus 20 A dengan tegangan 0,7 kV, ditumbuhkan pada substrat Si(111), dimana partikel np-LiCoO2+10%v/vPVDF membentuk morphologi ekuaksial. Perlakuan anil pada temperatur 600oC selama 1 jam pada lapisan tipis Pt/np-LiCoO2+10%v/vPVDF/Pt menunjukan bahwa butir kristal np-LiCoO2+10%v/vPVDF tumbuh dengan pada orientasi [107]. Lapisan tipis np-LiCoO2+10%v/vPVDF pada sistem lapisan Pt/np-LiCoO2+10%v/vPVDF/Pt, memiliki impendansi, kapasitansi dan konduktansi yang relatif baik.

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Nowadays, battery as a high energy storage, which is lightweight and capable of use in a long period of time, has been developed. Lithium ion battery is well known, where lithium ion is capable to produce large energy and electrode is used as reservoir of lithium ions. In this study, nano particle of LiCoO2 added with 5, 10, 15, and 20% of PVDF have been developed. nano particle of LiCoO2 was synthesized by using planetary milling and ultra sonic methods. Nano particle LiCoO2 + xPVDF was characterized by using SEM-EDX, XRD, TEM, PSA and conductivity analysis. The formation of micro battery was carried out by using magnetron sputter deposition (MSD) method. Micro battery of Si/Pt/LiCoO2/C6/Cu resulted from MSD was analyzed by using SEM-EDX, XRD, conductivity analysis, and Four Probe Analyzer. The results showed that nano particle of LiCoO2 + 10% v/v PVDF has the best conductivity, belong to the structure of rhombohedral with space group R-3m, with lattice parameter a = b = 2.8213 Å, c = 14.0446 Å. Thin film of Pt/np-LiCoO2+10%v/vPVDF/Pt system have been formed successfully at a current of 20 A and potential of 0.7 kV, on Si(111) substrate, where particle of np-LiCoO2+10%v/vPVDF formed an equaxial morphology. Annealing of Pt/np-LiCoO2+10%v/vPVDF/Pt at 600oC for 1 hour resulted in the growth of np-LiCoO2+10%v/vPVDF crystal grain at orientation of [107]. Thin film of np-LiCoO2+10%v/vPVDF on the system of Pt/np-LiCoO2+10%v/vPVDF/Pt showed fairly good impedance, capacitance and conductivity.