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講演題目 Development of Microbattery: An Overview
講演者 Rangasamy Baskaran 氏 (東北大学多元物質科学研究所)
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講演要旨

Thin film lithium or lithium ion micro batteries have received a lot of attention due to their potential application as backup power in micro electromechanical systems (MEMS), smart card, micro sensors, and biochips. Thin-film solid-state rechargeable lithium batteries are ideal micro power sources for many applications requiring high energy and power densities, good capacity retention and an extremely low self-discharge rate. In order to construct a thin film battery, all the components of anode, solid electrolyte, cathode and suitable current collectors should be fabricated into a multilayered thin film. One of the major challenges to the development of high power thin film lithium- ion micro battery is capacity fading caused by the interfacial resistance, less diffusion coefficient of ions between the heterogeneous interfaces and local degradation of the cell. A variety of cathode ($LiCoO_2$, $LiMn_2O_4$, $LiFePO_4$ etc.), electrolytes (LIPON, $Li_{3.4}V_{0.6}Si_{0.4}O_4$ etc.) and anode (SnO, $Li_4Ti_5O_{12}$ etc.) materials have been synthesized as thin films and evaluated for thin-film micro battery by various research groups.
Many researches have studied films of $LiNi_{1-x}Co_xO_2$ because of their high specific capacity, high voltage and long cycle-life by RF sputtering, electron beam evaporation and sol- gel method but all the films have suffered from a low discharge capacity due to the lack of stoichiometry. Pulsed laser deposition (PLD) technique is one of the successful methods in the growth of materials containing evaporable components with complex stoichiometry to fabricate micro battery. In the present investigation, thin film of $LiNi_{0.8}Co_{0.2}O_2$ (LNCO) has been prepared by Pulsed Laser Deposition (PLD) technique at various post annealing temperatures. XRD results of the LNCO films reveal crystalline nature around 500 600°C which are in good agreement with the electrochemical results. The cyclic voltammogram results reveal the LNCO thin films annealed at 500 °C yields highest discharge capacity of 95.6 μAh/cm2-μm at tenth cycle without any drastic capacity fading. Based on the structural and electrochemical results of LNCO, a lithium- ion micro cell has been constructed with LNCO/$Li_{3.4}V_{0.6}Si_{0.4}O_4$(LVSO)/SnO in the order of 1.535 μm and its electrochemical properties have been studied.

* 講演は英語で行なわれます。

連絡先

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