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Direct Electrochemical Deposition of $LiCoO_2$ Film in 100-200C Aqueous Solution

100-200C 수용액중 $LiCoO_2$ 박막전극의 직접 전착

최강훈, 한규승, 장순호*

Department of Fine Chemicals Engineering and Chemistry, Chungnam National University, Korea

** Telecommunication Basic Research Laboratory, Electronics and Telecommunications Research Institute*

Aqueous solution reaction combined with different activation methods such as electrochemical reaction, photochemical excitation, hydrothermal reaction, and/or application of microwaves or ultrasonics can be considered as an alternative approach to synthesize advanced solid state in an economical, less energy consuming, and environmentally friendly way. In fact, $LiCoO_2$ films were fabricated by the concentrated LiOH solution treatment of cobalt or cobalt-coated substrate in a single synthetic step at fixed temperatures over 20C without any post-synthesis annealing. Four independent film formation mechanism studies elucidate the key role of hydroxyl group in obtaining the $LiCoO_2$ films and also show that the formation of the $LiCoO_2$ films is fully based on dissolution-precipitation model. In addition, the results might be used to design an advanced film formation process. Here, well crystallized and electrochemically active $LiCoO_2$ film electrodes for lithium rechargeable microbatteries are directly deposited on electron-conducting substrates in 47M LiOH solutions containing cobalt species at a fixed temperature between 100 and 200C by a local supply of excess hydroxyl groups using a galvanostatic generation of hydroxyl groups with a fixed current density between 1.0 and 5.0mA/cm2. The fabricted films exhibit prospective electrochemical activity, first discharge capacity of 46Ah/cm2 for 8m thick film.