금속염을 이용한 염료감응 태양전지의 고체전해질의 전기화학적 특성

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Electrochemical properties of metal salts polymer electrolyte for DSSC

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Dye-sensitized solar cell(DSSC) have been considered one of the promising alternatives to conventional solar cells, because of their low cost, easy fabrication and relatively high energy conversion efficiency. However, although the cell offers reasonable efficiency at least 11%, the use of a liquid electrolyte placed technological challenges for achieving the desired durability and operational stability of the cell. In order to prevent or reduce electrolyte leakage considerable efforts have been made, such as p-type semiconductor or organic hole-transport material that better mechanical properties and simple fabrication processes. In this work, we synthesized solid-state electrolyte containing LiI and KI metal salt with starting materials of poly ethylene oxide to substitute liquid electrolyte enhance the ionic conductivity and solar conversion efficiency. Li+ leads to faster diffusion and higher efficiency and K+ leading to higher ionic conductivity. The efficiency of poly ethylene oxide/LiI system electrolyte is 1.47% and poly ethylene oxide/potassium electrolyte is 1.21%. An efficiency of 3.24% is achieved using solid-state electrolyte containing LiI and KI concentrations. The increased solar conversion efficiency is attributed to decreased crystallinity in the polymer that leads to enhanced charge transfer.

Acknowledgments : Following are results of a study on the "Human Resource Development Center for Economic Region Leading Industry" Project, supported by the Ministry of Education, Science & Technology (MEST) and the National research Foundation of Korea (NRF).

Key words : Dye Sensitized Solar Cell(염료감응 태양전지), Polymer Electrolyte(폴리머 전해질), Poly Ethylene Glycol(폴리 에틸렌 그리콜)

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태양광무인기를 위한 박막형 태양전지의 입사각 및 온도에 따른 성능분석

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Effects of the Incidence Angle and Temperature on the Performance of a Thin-Film CIGS Solar Cell for Solar Powered UAVs

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This research aims to study the effects of the incidence angle and surface temperature on the power generation performance of a thin-film CIGS solar cell for solar powered unmanned aerial vehicles (UAVs). The test rig consists of a unit CIGS solar cell is installed on a table whose angle is controlled manually. A K-type thermocouple is attached to the solar cell surface for temperature measurements. A solar module analyzer measures the voltage and current generated from the test solar cell. The solar module analyzer also calculates the maximum solar power and efficiency of the solar cell. All test data are acquired in a PC. Test results show that the solar cell efficiency decreases significantly with increasing incidence angle and increasing surface temperature in general. As the incidence angle increases from 0 degree to 90 degree, the solar cell efficiency decreases by 60%. The solar cell efficiency decreases by 10% with increasing solar cell surface temperature from 20°C to 30°C, for exmaple. The direct cooling method of the solar cell using dry ice decreases dramatically the solar cell surface temperature, thus increasing the solar cell efficiency by 15%.

Key words : Solar Powered UAV(태양광 구동 무인항공기), Thin-Film CIGS Solar Cell(박막형 화합물 반도체 솔라셀), Incidence Angle(입사각), Temperature(온도)

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