ZnO 나노구조체를 이용한 염료감응형 태양전지의 광전효율

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Photovoltaic Performence of Dye-sensitized Solar Cells using ZnO nanostructures

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Due to the rapidly diminishing energy sources and higher energy production cost, the interest in dye-sensitized solar cells (DSSCs) has been increasing dramatically in recent years. A typical DSSC is constructed of wide band gap semiconductor electrode such as TiO_2 or ZnO that are anchored by light-harvesting sensitizer dyes and surrounded by a liquid electrolyte with a iodide ion/triiodide ion redox couple. DSSCs based on one-dimensional nano-structures, such as ZnO nanorods, have been recently attracting increasing attentiondue to their excellent electrical conductivity, high optical transmittance, diverse and abundant configurations, direct band gap, absence of toxicity, large exiton binding energy, etc. However, solar-to-electrical conversion performances of DSSCs composed of ZnO n-type photo electrode compared with that of TiO_2 are not satisfactory. An important reason for the low photovoltaic performance is the dissolution of Zn^{2+} by the adsorption of acidic dye followed by the formation of agglomerates with dye molecules which could block the I- diffusion pathway into the dye molecule on the ZnO surface. In this paper, we prepared the DSSC with the ZnO electrode using the chemical bath deposition (CBD) method under low temperature condition (< 100℃). It was demonstrated that the ZnO seed layers played an important role on the formation of the ZnO nanostructures using CBD. To achieve truly low-temperature growth of the ZnO nanostructures on the substrates, a two-step method was developed and optimized in the present work. Firstly, ZnO seed layer was prepared on the FTO substrate through the spin-coating method. Secondly, the deposited ZnO seed substrate was immersed into an aqueous solution of 0.25M zinc nitrate hexahydrate and 0.25M hexamethylenetetramine at 90℃ for hydrothermal reaction several times.

Key words : ZnO nanostructures(산화아연 나노구조체), DSSCs(염료감응형 태양전지)

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다공성 실리콘을 이용한 결정질 실리콘 태양전지 반사방지막에 관한 연구

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The research of anti-reflection coating using porous silicon for crystalline silicon solar cells

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The crystalline silicon solar cells have been optical losses. but it can be reduced using light trapping by texture structure and anti-reflection coating. The high reflective index of crystalline silicon at solar wavelengths(400nm～1000nm) creates large reflection losses that must be compensated for by applying anti-reflection coating. In this study, the use of porous silicon(PSi) as an active material in a solar cell to take advantage of light trapping and blue-harvesting photoluminescence effect. Porous silicon is form by anodization and can be obtained in an electrolyte with hydrofluoric. We expect our research can results approaching to lower than 10% of several reflectance by porous silicon solar cells.

Key words : Porous silicon(다공성 실리콘), Anti-reflection coating(반사방지막), Solar cell(태양전지), Reflectance(반사율)

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