Characteristics of TCO-less dye-sensitized solar celss using ZnO nanorods grown by hydrothermal method

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Dye-sensitized solar cells (DSSC) is beingextensively investigated as the next generation energy source. DSSCs are one of the strong alternatives toconventional Si-based solar cells due to various advantages such as variouscolors, transparency, comparable efficiency to that of an amorphous Si solarcell, and possibility of mass production. Also, DSSC research has beenbroadened to many applications such as flexible devices, module with largesize, windows with transparency in need. Despite of theattractive features like simple fabrication process and its economicefficiency, there are some problems such as low efficiency, long fabricationtime and low long-term stability. In this work, to improve the conversion efficiency ofDSSC, we proposed TCO-less DSSC as the structures and ZnO nanorods as the lightabsorbing layer. ZnO nanorods were fabricated on the seed layer-coatedglass by hydrothermal method at the condition of aqueous solution containing zincnitrate ($Zn(NO_3)_2$?$_6$ H2O) andhexamethylenetetramine ($C_6H_{12}N_4$) of concentrationof 0.1 M with molar ratio of 1:1. And also, the TCO-less DSSC was proposed due tostructural advantages in photovoltaic cells, such as the increased incidentvisible light and high electrical conductivity for efficient charge collection ofmetal electrodes. Ti metal electrode in the DSSC structure was fabriatedby a magnetron sputtering system. The properties of the fabricated ZnO nanorods were investigated by variousmethods, such as field emission scanning electron microscopy, X-ray diffraction,and UV-visible spectrophotometer. Also, the TCO-less DSSC fabricated with ZnOnanorods was investigated by using current-voltage measurement and solarsimulator.