

Effect of Sheet Resistance of ZnO:B Layers by MOCVD on Efficiency of CIGS Solar Cells

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Zinc oxide (ZnO) is an auspicious alternative transparent conducting layer to the commonly used ITO due to its non-toxic and abundance nature. To improve the electrical conductivity and optical transmittance of ZnO layer, group III elements are usually doped into ZnO [1] and the corresponding doped ZnO layers are responsible for PV performance of cell. Several techniques such as, DC sputtering [2] RF sputtering [3], molecular beam epitaxy (MBE) [4], metal organic chemical vapor deposition (MOCVD) [5] etc., are available for the formation of the ZnO layers. Among them, MOCVD is best for large scale mass production and produce buffer layer and absorber layers without damage. In this study, we prepared B-doped ZnO layers by MOCVD using Diethylzinc ($\text{H}_2\text{O}/\text{DEZn}$) and Boron trihydride (B_2H_6) as the sources of ZnO and B respectively. Furthermore, CIGS based solar cell was fabricated using those layers. In the process of MOCVD, reaction materials that contain Zn and O atoms supply to the heated substrate and make ZnO crystal nucleus. Subsequently, generated numerous nuclei are combined to grow a crystal. At this time the desired conductivity is controlled by B-doping. Simultaneously, controlling the reaction temperature, reaction material and flow rate of doping gas is also needed for getting significant properties of layers. This paper explores the effect $\text{H}_2\text{O}/\text{DEZn}$ flow rate on sheet resistance of ZnO:B layers and its influence on efficiency of CIGS solar cell, was shown in Fig. 1. As the flow rate of $\text{H}_2\text{O}/\text{DEZn}$ varied from 0.7 to 1.3 sheet resistance of ZnO:B layer changed in the range, 100-430 ohm/Sq. However the change in the efficiency of CIGS solar cell was marginal. Hence we concluded that the efficiency of cell may not be influenced by the sheet resistance of ZnO:B layer.

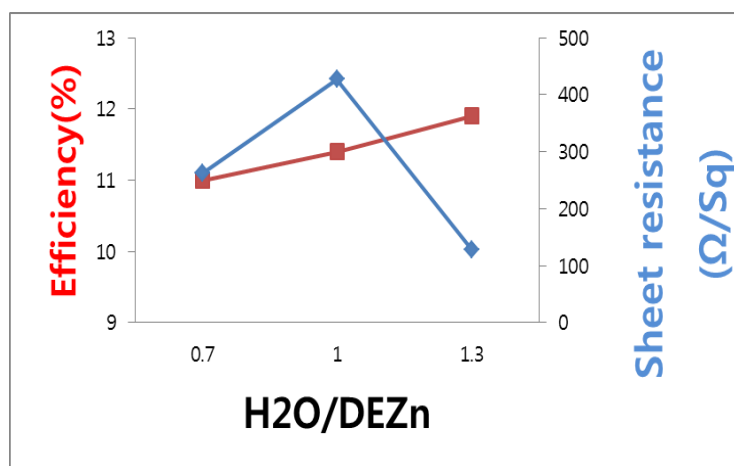


Fig. 1. Variation of CIGS efficiency with sheet resistance of ZnO:B layers
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