Composite-type Hybrid Photoelectrodes for Dye-Sensitized Solar Cells with Plastic Substrates

Min Jae Ko1*, Kicheon Yoo1,2, Jong Hak Kim2
1Solar Cell Research Center, Korea Institute of Science and Technology (KIST), Seoul, 136-791, Korea
2Department of Chemical Engineering, Yonsei University, Seoul, 120-746, Korea

(Corresponding Author: Min Jae Ko, mjko@kist.re.kr)

Dye-sensitized solar cell (DSSC) has a unique property such as transparent and colorful characteristics, compared to other type of solar cells. Recently, plastic substrate based DSSCs are able to retain the transparency like glass based ones, in addition to this advantages, and hence it is promising as the light weight, flexibility, and roll-to-roll process.

However, conventional high temperature fabrication technology for glass based DSSCs, cannot be applied to flexible devices because polymer substrates cannot withstand the heat more than 150 °C. Therefore, low temperature fabrication process, without using a polymer binder or thermal sintering, was required to fabricate necked TiO2. Besides, the photovoltaic performance, good mechanical property is also an important factor as a requirement for the flexible solar cells.

In order to address these issues, we developed polymer/TiO2 nanocomposite electrodes, which can be applicable to plastic DSSCs. Poly(methyl methacrylate) (PMMA) were coated on the dye-sensitized TiO2 photoelectrode by spin-coating method to construct hybrid polymer-TiO2 electrode. The concept of composite electrode takes an advantage of utilizing elastic properties of polymers, such as good impact strength. We will report photovoltaic performance and mechanical properties of these plastic DSSCs.