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Bendable Photoelectrodes by Blending of Polymers with TiO_2 For Low Temperature Dye-sensitized Solar Cells

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Dye-sensitized solar cells (DSSCs) based on plastic substrates have attracted much attention mainly due to extensive applications such as ubiquitous powers, as well as the practical reasons such as 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 ^{o}C. Therefore, low temperature fabrication process, without using a polymer binder or thermal sintering, was required to fabricate necked TiO_2. In this presentation, we proposed polymer-inorganic composite photoelectrode, which can be fabricated at low temperature. The concept of composite electrode takes an advantage of utilizing elastic properties of polymers, such as good impact strength. As an elastic material, poly(methyl methacrylate) (PMMA) is selected because of its optical transparency and good adhesive properties. In this work, a polymer-inorganic composite electrode was constructed on FTO/glass substrate under low temperature sintering condition, from the mixture of PMMA and TiO_2 colloidal solution. The effect of PMMA composition on the photovoltaic property was investigated. Then, the enhanced mechanical stability of this composite electrode on ITO/PEN substrate was also demonstrated from bending test.

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