

Opportunities for FTO/NSG TEC™ Glass as a Functional Substrate in 3rd Generation PV

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Abstract

This research project investigates fluorine-doped tin oxide (FTO) and NSG TEC™ glass as a substrate for perovskite solar cells (PSC's). At present, tin-doped indium oxide (ITO) coated glass is one of the main substrates for laboratory prepared high performing solar cells. However, FTO is already mass-manufactured inexpensively via a chemical vapor deposition (CVD) technique and is the transparent conductive coating of choice for many industrial thin films. The glass conglomerate NSG commercially produces a range of TEC™ glass originally designed for solar control applications. Yet, it has shown excellent potential for the use as a substrate in PSC's. The CVD fabrication method avoids inconsistencies and difficulties related to the scaling up of lab-scale solution-based deposition methods such as spin coating or spray pyrolysis. The project will explore several different routes into investigating the substrate, including in-depth analysis and characterization with comparison against laboratory-built devices and, in particular, understanding the advantages over ITO. Modifications will be implemented to improve overall device performance, such as selective patterning of oxide layers to elevate charge transfer between an electrode and FTO at a series interconnection. Evaluation will be carried out over a range of conditions, with a particular focus on optimizing the characteristics of the blocking layer to enhance the performance of perovskite solar cells (PSCs).

Keywords

Fluorine-Doped Tin Oxide, Perovskite, Tin-Doped Indium Oxide, Chemical Vapor Deposition