Transparent thin films for TCOs replacement – A Roll-to-Roll approach

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Abstract

Traditionally, doped metal oxides have the most widespread use for various applications requiring a transparent conductor. These materials have been well researched and refined during the last fifty years. Over the time, applications changed toward more electronic device fabrication and more advanced techniques became available in order to produce thin films composed by metal oxides. Conductive polymers, the organic analog to metal oxides, have a technical genealogy traceable to the 1970s with the discovery of polyacetylene. New conductive polymers were posteriorly discovered as PEDOT:PSS but the low conductivity obtained has lead to develop more studies in order to improve it [1].

Doped metal oxides and conductivity polymer material classes, dominated the 20th century with metal oxides as the most technically advanced and utilized material. At the beginning of 21th century, rapid advances in nanomaterials have brought about interesting, emerging material alternatives, which will challenge ITO's dominance in traditional applications, and open up possibilities for new applications [1].

With new emerging materials, the possibility of use different techniques to process thin films becomes extremely promising. One of the most important options are the techniques that apply a printing or coating procedure, capable of being used as a continue process like roll-to-roll technique, thus lowering the prices of the built devices. A range of examples could be found on literature related with the analysis of low cost processes in the production of organic electronic devices as organic photovoltaic's (OPV's) [2].

In this work there is the evaluation of the possibility to apply techniques such as Screen Printing and Slot-Die to process a hybrid film using PEDOT:PSS and Silver, in order to understand the influence of the silver pattern and the respective lines width on the equivalent resistance of a thin film. In addition, studies will be carried out related with the morphology and the percentage of light that crosses the hybrid film.

References

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