POSTER – MECHANICAL STABILITY OF ENCAPSULATED ORGANIC SOLAR CELLS

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To increase the lifetimes of OPV devices and protect them to water and oxygen, an encapsulation system is required. In this paper, we proposed a fundamental study of the impact of flexible encapsulation by R2R process on initial performance and mechanical reliability of OPV device. We demonstrate how a peeling technique relatively simple to set up using only device materials can be applied to flexible R2R processed inverted polymer solar cells on polyethylene terephthalate substrates. Thanks to the study of partial device, the peeling strength between each layer of device, which can be directly correlated to the quality of interface adhesion, can be evaluated. This provides a quantitative analysis of mechanical strength of each interface in device. As shown in literature, one of the weak interfaces is that between active layer and PEDOT:PSS. We have also shown the presence of other weak interfaces in the device, in particular between the TCO / ZnO and ZnO / Al. In order to improve the quality of the above-mentioned interfaces, the study of an additive treatment of ZnO on the mechanical stability and the performances of the device is proposed. It seems that an optimized UVO3 treatment can substantially modify the surface properties of ZnO and thus improve the adhesion properties in the device. The impact of the treatments studied on the physicochemical and structural properties of ZnO has been studied by infrared spectroscopy. Finally, the impact of encapsulation on the performance of the OPV device in the case ZnO untreated and UVO3 treated was studied. We demonstrate clearly that improving the quality of the interfaces within the device leads to an improvement of performance.

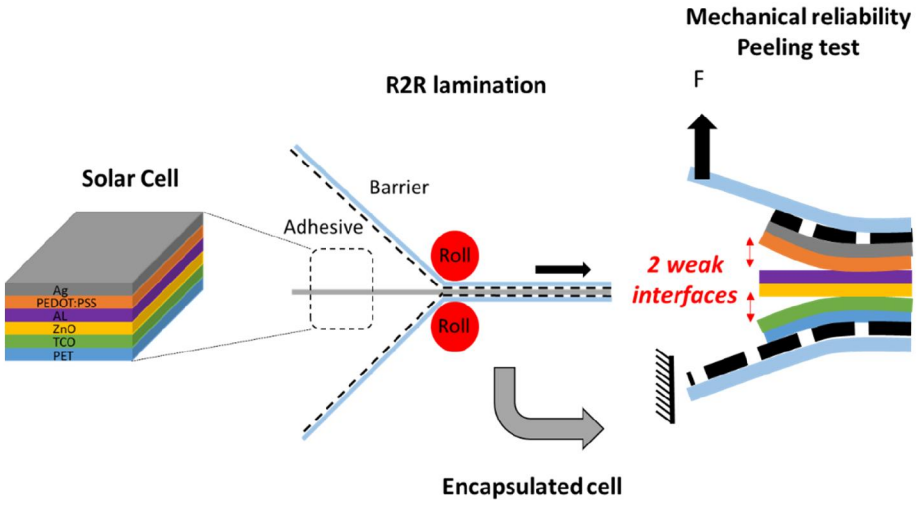

Figure 1: Mechanical stability of encapsulated organic solar cell