

MSc Thesis, S. Tsimikli:

“Development of High Barrier Films for Encapsulation of Organic Photovoltaics and Their Effect on OPV Efficiency”

Abstract

The rapid development of Organic Electronics (OEs) leads to a variety of novel devices that can produce or keep energy (e.g. Organic Photovoltaics), and also promote display, sensors and transistor applications. A fragment for this development is the device sensitivity to moisture and oxygen, which is known that lead to the degradation in most of the Organic Electronic Devices. The development of high barrier materials is under investigation, for the achievement of minimum lifetime which is needed for these applications. However, there are not many studies that combine the characterization, the simulation and the encapsulation of OEs with high barriers films. These studies are necessary, in order to understand the encapsulation with high barrier films and to find techniques that significantly improve their efficiency.

In this work, hybrid barrier layers were coated onto inorganic barrier structure and it was investigated how it affects not only the barrier, but also the optical properties, and the stability of the mixture after 15 weeks time. Finally, OPVs were encapsulated with commercially available barrier films, for testing the effect on the lifetime and the stability of the device. Regarding the stability, there were made comparisons under different parameters of encapsulation. Concerning the degradation study, there have been made comparisons with the initial efficiency and how it is affected from the exposure time, based on defined standards, in order to have a correlation between WVTR and lifetime of encapsulated OEs.