Abstract

The last years much attention has been paid on improving the efficiency of opto-electronic devices, which is mainly a materials issue. Therefore focus must be paid on the development and functionalization of materials for flexible electronic devices, especially on the polymeric active layers, such as PEDOT:PSS and on Transparent Conductive Oxides (TCOs). The already well-studied TCOs like Indium Tin Oxide (ITO) needs to be replaced due to the high production cost, it is not compatible to all flexible substrates, it is toxic and brittle. Zinc Oxide (ZnO) is a wide direct band-gap semiconductor having the hexagonical crystal structure of wurtzite and high exciton bind energy. Moreover it appears to have high electrical conductivity, piezoelectricity, easy fabrication, low cost, non-toxicity and many application advantages. Dopants in ZnO have been studied intensively the last years especially aluminum (AZO) due to the improvement in optical and electrical properties. Nevertheless much effort should be made in order to fully understand the working mechanism of pure and doped ZnO for application on Flexible Electronic Devices (FEDs). Organic conductors such as PEDOT:PSS are used as hole transfer layers in FEDs and other applications like sensors, solar cells, etc. Moreover, a p-n junction that would be functional in OLEDs and OPVs devices was developed. P- type thin films of Poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT: PSS) were spin coated onto ZnO/ PET thin films and their properties were evaluated with respect to the ZnO thin film thickness as well.

Moreover, emissive layers such as P3HT mixed with different solvents and the small molecule a-quaterthiophene, were deposited onto flexible and rigid substrates for further and in deep research, revealing the optical properties of these materials and a database for further research to the following researchers.