Abstract

During the last years there has been an intense research activity on novel materials which can be used in innovative electronic devices. The core of this research is the replacement of conventional materials, such as Silicon, Gallium, Germanium, used for the past 50 years in electronics. The reason is the increase of expectation because of the advancement of technology and simultaneously the need for less expensive and environmental friendly materials. In order to come up to these needs the research community looks to organic materials. The main applications can be found in the following areas: imaging (Organic Light Emitting Diodes), Energy (Organic Photovoltaics), Integrated Circuits (Organic Thin Film Transistors).

In the framework of this Master Thesis, materials that could be used in innovative electronic devices were developed and characterized. Several methods were used for the synthesis of these materials, whereas *X-Ray Techniques* were performed for their characterization.

At first, we studied transparent conductive oxides and specifically **ZnO** and **ZnO:Al** (dopped Aluminum). These materials were deposited on PET substrate by Pulsed DC Magnetron Sputtering. For ZnO deposition the power of the target was kept constant and there were experiments conducted with different time depositions. For ZnO:Al we performed two experimental series. At the first series we kept the time of deposition constant whereas we modified the power. At the second series we modified the times of deposition, keeping the power constant. The developed samples were measured with ***X-Ray diffraction*** in order to note the structure modifications of the thin films.

In the area of organic materials **PEDOT:PSS** was deposited in Silicon with Spin Coating. We used two different chemical formulas PEDOT:PSS of *Clevios* Company and we developed two series of samples. The first series contained depositions of *PEDOT:PSS* (**PVPAI 4083**) and the second of *PEDOT:PSS* (**FE**). At the first series the influence of the rounds of Spin Coating were studied, while at the second series we examined the influence of **DMF** solvent addition. The thin films were characterized with ***X-Ray Reflectivity***.

During the last experimental part we performed thermal evaporation in order to deposit a-quaterthiophene on Silicon. We studied the influence of the evaporation temperature on the structure and the morphology of thin films developed. The characterization of the structure was done using X-Ray Diffraction, whereas the morphological characteristics were determined by ***X-Ray Reflectivity and Atomic Force Microscopy* (*AFM*)** measurements.