Αγγλική Περίληψη

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, that 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. Organic materials and mostly organic semiconductors seem to be very promising materials, with their main application concerning imaging (Organic Light Emitting Diodes), Energy (Organic Photovoltaics) and Integrated Circuits (Organic Thin Film Transistors). High-performance optoelectronic devices based on π-conjugated organic compounds have been extensively investigated due to their potential advantages such as the ease of synthesis and processing, the low cost and the excellent mechanical flexibility. Among a wide variety of organic semiconducting molecules, α,ω,-dihexylsexithiophene (DH-6T) has attracted particular attention due to its high field-effect mobility and enhanced stability. In the present work, "top-contact" organic thin films transistors (OTFTs) based on DH-6T were realized using vacuum evaporation onto Si substrates. Self Assembled Monolayers (SAMs) such as Hexamethyldisilazane (HMDS) and other non-polar dielectrics such as poly(methyl methacrylate) (PMMA) or poly(styrene) (PS) were utilized as modifying layers over SiO_2, in order to study their influence to the structural and morphological properties of the semiconductor. Furthermore, comparative investigations of the effects of interface treatment using thermal post-annealing were conducted. The analysis of the characteristics of the various devices revealed a significant improvement in the electrical behavior, in terms of hysteresis, threshold voltage, I_{on}/I_{off} ratio and charge carrier mobility when using SAMs or polymeric passive layers and thermal post-treatment. Another part of experiments had to do with the rate of deposition of the semiconductor and the influences it may have in the structure and morphology of thin films developed. Device Degradation after one month in air was measured during the last experimental part. Several methods were used for the synthesis of materials such as spin coating, thermal evaporation and e-beam evaporation. The characterization of the structure was done using X-Ray Diffraction, whereas the morphological characteristics were determined by Atomic Force Microscopy (AFM) measurements.