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Growth and characterization of α-terthienyl(3T) and terthiophene(6T) thin films by vacuum evaporation technique

박주상[2],권오관[1],김영관[1],손병청[1],김용인[3],최종선[3],박미경[1],신동명[1],강도열[3]
[1]홍익대학교 화학공학과, [2]홍익대학교 물리학과, [3]홍익대학교 전기공학과

Conducting polymers with π-conjugated double bonds in their backbone have band structures similar to those of inorganic semiconductors such as silicon. It is well known that amorphous silicon (a-Si) thin film transistors (TFTs) are used in large-area liquid-crystal displays for switching liquid crystals. On the other hand, a lot of efforts have been devoted to fabricate TFTs with conducting polymers from the standpoints of low-cost and flexible TFT production. One of the most important parameters for TFTs characteristics is carrier mobility. There are mainly two approaches to improve carrier mobility. One approach is to use highly purified thiophene oligomers in order to reduce the carrier scattering by impurities. The other approach is to use conducting polymers with large π-conjugation length having smller bandgap energy.

The former approach for insulated-gate TFTs was seleted to obtain the higher carrier mobility in organic TFTs. In this study, thin films of α-terthienyl (3T) and sexithiophene (6T) were prepared on various substrates by vacuum evaporation method. The structure, orientation, and surface morphology of these films as a function of substrate temperature were studied by using X-ray diffraction, UV-visible spectroscopy, and scanning electron microscopy. Electrical conductivity of these films were also measured by using four-point probe method. Further details will be discussed.