

The effect of surface on electrical properties of OTFTs using HfO₂ film as the gate insulator

K. -J. Kim¹, S. -W. Jeong¹, Yonghan Roh¹

¹School of information and Communication engineering, Sungkyunkwan University

We present the effect of surface of OTFTs on electrical properties using HfO₂-film as gate insulator. Surface properties of organic thin film transistors(OTFTs) such as frictional or abrasion, permeability, insulating properties, wettability and chemical reactivity are important. Because surface characteristic is strongly dependent on a molecular aggregation state of the surface. Therefore, the control of a molecular aggregation state on the film is important to construct a highly functionalized surface.

The HfO₂ film was deposited on the glass substrate by the RF-sputtering system. After the surface treatment, the contact angle, which is One of the most effective ways of studying surface properties, and surface free energy were measured in order to analyze the surface state changes.

From the electrical measurements, typical I-V characteristic and the field effect mobility of TFTs were observed. Using HfO₂ film, which has high dielectric constant(~30) and relatively low leakage current, we can be obtained low surface energy. At this low surface energy can be improved electrical characteristic of OTFTs devices. Also HfO₂ of low surface energy allow the enhancement of carrier mobility.

Consequently, surface free energy of gate dielectrics is a characteristic factor, which affects the performance of the OTFTs. The field-effect mobility is increased monotonically with the surface energy decrease.