

## Fabrication of vertical type organic bipolar junction transistor

Gunchul Shin<sup>1</sup>, Jeong Sook Ha<sup>1\*</sup>, Gyu Tae Kim<sup>2</sup>, Jaehyun Park<sup>1</sup> and Hyun Jin Ji<sup>2</sup>

<sup>1</sup>Department of Chemical and Biological Engineering

<sup>2</sup>School of Electrical Engineering Korea University

Organic thin film transistors(OTFTs) have attracted considerable interest because of their flexibility, low cost, light weight and easy process over large areas. Such various merits gave promising application of OTFTs to electronic circuits, displays, and sensors.

Attempts to enhance the performance of OTFTs have mainly relied on the decrease of the channel length and the increase of the cross-sectional area for the larger operation currents. Vertical type-OTFT is one of the best alternatives to decrease the channel length and increase the channel width, effectively at the same time.

We fabricated the vertical junction transistor via micro-contact printing method combined with Langmuir-Schaefer technique.

NPN like junction transistor, we made, consists of two schottky junction diodes connected in a back-to-back configuration by a shared anode region. This device could control the larger current by a small bias current like a conventional transistor. The formation of the ohmic contacts in the base region enables the easy injection of holes through the emitter, acting as a NPN-type transistor. So the control of the contact properties was crucial to achieve the proper operation of organic junction transistors.

By use of the soft-lithography techniques without any other conventional lithography, we could fabricate a vertical type junction transistor with low operating voltages of a few volts, but high current levels of a few milliamps. We will discuss the operation mechanism of such formed junction transistor in terms of the electrical contact between metal and semiconductor, in detail.