

## **ELECTRONIC TRANSPORT IN MOLECULAR SCALE DEVICES**

**Takhee Lee, Hyunwook Song, Tae-Wook Kim, Gunuk Wang**

Department of Materials Science and Engineering, Gwangju Institute Science and  
Technology (GIST), Gwangju 500-712, Korea

Corresponding Address: Takhee Lee  
tlee@gist.ac.kr

### **ABSTRACT**

The charge transport of molecular self-assembled monolayers (SAMs) is studied using various characterization platforms: nanoscale device, micro-via hole structure device, and a structure for conducting atomic force microscopy (CAFM), in which lateral areas span from the nanometer to the micrometer scale.

Nanoscale devices, so called nanopore device, were used to study detail conduction mechanism of alkanethiol SAMs by current-voltage characterization and inelastic electron tunneling spectroscopic characterization.

Micro-via hole structure devices were also fabricated to study conduction mechanism of alkanethiol SAMs and particularly the device yield study. The devices were characterized by length-dependent and temperature-dependent current-voltage measurement. The device yield of micro-via hole structure devices was found as  $\sim 1\%$  out of more than 13,000 fabricated devices. The criteria of determining working molecular devices is proposed.

Using the structure for CAFM, we estimate a degree of molecular tilt of alkanethiols by a mechanical contact theory, and then study the effect of tilt angle on current-voltage characteristics, e.g., chain-to-chain coupling under the influence of tip contact to SAM.