SUBJECT: Ph.D. Dissertation Defense Presentation

BY: Heungjoo Shin

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LOCATION: Love Building Room 311(3th Floor)

TITLE: Fabrication of Atomic Force Microscope Probes Integrated with Electrodes for Micro Four-Point Probe and SECM-AFM

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SUMMARY

This study shows the development of tools for electrical characterization of semiconductor devices and sensor devices, and for electrochemical imaging respectively. The both tools were designed on the basis of the AFM (Atomic Force Microscope) cantilevers that allow for highly accurate control of the probe positioning, low contact force, micro-size and topological image scanning.

As a characterization tool of semiconductor device and MEMS device, a micro four-point probe was developed. The probe inherited the advantages as a characterization tool from four-point probe and AFM. It can measure sample conductivity without any recourse to standard sample and be positioned on small sample area with high resolution. This study presents a fabrication method for a micro four-point probe with solid nickel tips and experimental results using the probe.

A novel batch fabrication method for SECM-AFM (Scanning Electrochemical Microscope-Atomic Force Microscope) tip integrated with a ring electrode was developed as a tool for electrochemical imaging. The electroactive area at an exactly defined distance above the apex of the AFM tip is fabricated using an inverse silicon mold technique. The electrode at a deliberately chosen distance from the end of a scanning probe tip allows one to obtain the electrochemical data separated from the topographical image. This study shows the very first imaging of bio-sample reactivity with batch fabricated SECM-AFM probe.