**NCRC** 

## TAKAHASHI LAB.

## [Nano-probing Technologies]

**Department of Informatics and Electronics** 

http://www.spm.iis.u-tokyo.ac.jp

Nano-electronics

Department of Electrical Engineering and Information Systems

## Development of novel nano-probing technologies and nano-scale characterization of nano-materials for future device application

We aim at investigating electronic and optical properties in various nano-materials by means of nano-probe methods such as scanning tunneling microscopy (STM), atomic force microscopy (AFM) and related ones.

- Characterization of Solar Cell Materials -
  - Photovoltaic properties and minority carrier dynamics
  - Photothermal spectroscopy by AFM

(a) Topography

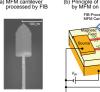
(b) Potential



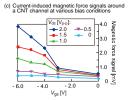
(a) Topography, (b) surface potential and (c) photovoltage on Cu(In,Ga)Se<sub>2</sub> [CIGS] solar cell

- ♦ Characterization of Carbon Nanotube FETs
  - Current detection

by magnetic force microscopy (MFM)

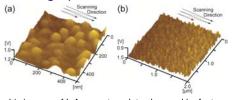






Channel properties in CNT-FET examined by current-induced magnetic force measurements by MFM

- Development of Novel SPM Methods
  - · Fast imaging in AFM
  - · Novel operation methods for high performance SPMs



Topographic images of InAs quantum dots observed by fast mode AFM

- Physics in Quantum Nanostructure
  - Observation of physical phenomena in low-dimensional semiconductors

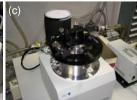
(b-1) Photo-induced STM curren [Light Polarization ⊥ Wire]

(b-2) Photo-induced STM current [Light Polarization // Wire] 50 nm

Photo-induced current signals on InAs wire structures observed by STM under light illumination













Variable temperature SPM in ultra-high vacuum

Multi-functional SPM equipments: (a) air type, (b)/(c) high vacuum and variable temperature type