

Convergence of NT and BT based on atomic and molecular level analysis and control

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In the first half of this presentation, the potential and effectiveness for generating new and noble science and technology through the convergence of quite different specialties will be discussed regarding to the possibilities and problems. A couple of examples of effective collaborations between different fields will be shown and discussed.

Recently, a national long term project on nano-bio convergence technology for measurement and control of single cell has been launched. In the second half of the talk, its scope and targets, major R&D themes, overall schematics and strategy will be summarized. Priority is given to laser technologies for cell trapping, sorting, chemical mapping with CARS and confocal microscopy, and cell nano-fabrication due to its intrinsic in-vivo characteristics. Mass spectrometric techniques such as FTMS, TOF-SIMS, MALDI are the major tools for single cell and biomaterials surface and interface analysis. For detection of metabolites from a single cell, fabrication of nano sensing devices with high sensitivity and selectivity will be studied. Nano scale scanning probe microscopy combined with Raman, SPR and ellipsometry, bio-modified tip will be for biochemical mapping of cell membranes and biochip surfaces with higher sensitivity, selectivity, and spatial resolution. Spatial resolution in the range of 10 ~ 100 nm will be required to most of the techniques to be developed in this project. Emphasis will be given on the in-vitro analysis of living cells but in some cases, cell freezing and fracture methodology will be adopted for more detailed information. Some of preliminary results will be presented and discussed.

Developed sub-cellular measurement and control techniques will be focused to understanding of disease mechanism, drug discovery, and tissue engineering. Mutually complementary collaborations between different fields and countries should be encouraged.