

# The functional nano probe sensor and biochip system for Bio-SPM System

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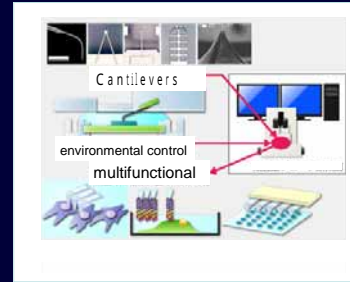
## Backgrounds

The SPM observation needs in the environment in liquid of biomaterials, such as a cell and a chromosome, are increasing increasingly in research next to a post-genome.

In the SPM observation in the environment in liquid, optimization of the form of a cantilever sensor is important. It is because the influence of the viscous resistance in liquid becomes large as compared with a vacuum or air environment and makes control of a cantilever difficult as a result.

As one method of solving these problems, optimization of a mechanical performance, surface chemical ornamentation, etc. in the liquid of a cantilever probe are mentioned. We are furthering development of a chemical and biosensor that the probe made from such development process should be applied while furthering development of the probe optimized by the environment in liquid.

We optimize the probe sensor through such a research, and are applying to application to Wet-SPM and the biochip system.



## Bio-SPM System

Optical microscope  
NIKON TE2000U / OLYMPUS IX71

All object lens can be installed.

Environmentally changeable observation cell  
temperature value, Ion, PH..

vertically approaches the sample.  
No interference in the condensing lens.

fluorescence  
Optical imaging system  
topographic  
SPM system  
multifunctional  
ion electrochemistry

optical Image fluorescent Image fusion Image

Example of application

## Prototype : Micro Cantilever & sensor probe

Probe  
damping effect

MEMS

Two-Photon Photopolymerized

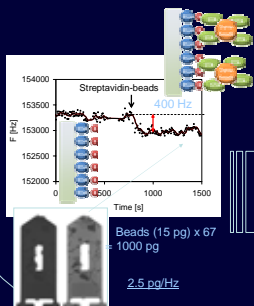
polymer  
Si

Weight balance test sample

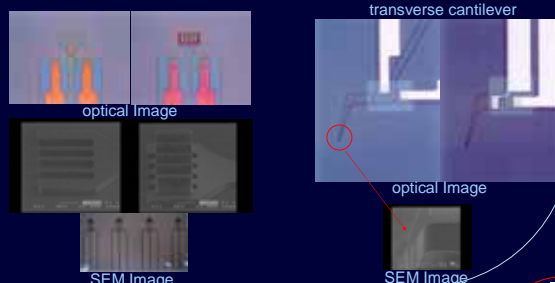
All polymer probe & AFM image

Tip-sample distance vs damping

## Piezo resistive Micro balance sensor



## Hi-Tip Piezo cantilever



## Biochip system

probes

antibody

Antigenic protein

Ferritin BSA Avidin

Anti-ferritin antibody

Micro contact (PDMS)

New methods

AFM analysis of interaction forces between bio-molecules using ligand-functionalized polymers  
 e-Journal of Surface Science and Nanotechnology 4:149-154 (2006)  
[http://www.istage.ist.gy.jp/article/ejsant/4/04\\_149/](http://www.istage.ist.gy.jp/article/ejsant/4/04_149/)

## Conclusion

- (1) We developed an SPM combined with inverted optical microscope without any reduction of its function.
- (2) The micro cantilever sensor & bio-sensor of the Self-Sensitive piezo resistive type was developed for wet-SPM system.
- (3) We researched the biochip system that inspected the antigen and the antibody reaction, and tested with the model protein.

Future..sensor..evaluation..system..develop.