

**Angle Resolved Spectroscopic Observation of Electron Beam induced Radiation
from Nano-Structures excited by Low-Energy Electron Nanoprobe**

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【Outline of survey】

In the present work we use a focused electron beam formed in an aberration corrected electron microscope to excite materials and observe light emission from a localized area. In the new system a nano-probe is given by an aberration corrector at low accelerating voltages, and a large working space around a specimen in TEM is provided as well. This enables us to install a light collection mirror in that space and to develop a new system for an angular resolved measurement as well as a position sensitive measurement. Information on the electronic states formed in nano-structures can be obtained from measurements of photon energy and momentum. Several kinds of light will be detected from newly developed materials such as luminescence from GaN-related compounds, transition radiation from insulator films of high-k materials in semiconductor devices, and surface plasmon radiation from metallic nano-structures. The present system will be applied to the study of distribution of atoms producing the luminescence, fluctuation of dielectric constant in the insulator thin films, and localized electric fields between metal particles which causes the surface enhanced Raman scattering.

【Expected results】

The aberration corrected electron microscope realizes a sub-nanoscale probe at low accelerating voltages, and can contribute to fundamental study of electron beam sensitive phenomena, such as luminescence of semiconductors, insulators and polymers. Especially it enables us to examine an atomic scale model of the luminescence in InGaN compounds, fluctuation of dielectric constant of high-k materials used as an insulator film in semiconductor devices and a localized electric field distribution of surface plasmon in metal surfaces with nanoscale-periods. This research will contribute to not only a fundamental science but also to the developments of application techniques for light emitting diodes, sensors and other functional devices.

【References by the principal investigator】

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【Term of project】 FY2007—2011

【Budget allocation】 16,200,000 yen
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【Homepage address】

<http://wwwsurf.phys.titech.ac.jp/tylab/>