東京大学
微細構造解析
プラットフォーム
The University of Tokyo

東京大学微細構造解析プラットフォーム
公開講演会

“STEM-EELS Probing Lattice Vibrations in Thin Films and Surface Phonon Polaritons in Nanostructures”

Prof. Peng Gao

[1]International Center for Quantum Materials, Peking Univ.
[2]Electron Microscopy Lab. Peking Univ, China

The recent advances in aberration corrected electron microscope equipped with monochromator and cold-field gun enables an electron probe with ~6 meV in energy resolution and ~60 pm in spatial resolution, allowing us to spatially map the lattice vibration even down to the atom level by using electron energy loss spectroscopy (EELS). Recently, by using this technique we study the lattice vibration behavior in a couple of material systems. For example, for a SiO_2 film on Si substrate, we mapped the lattice vibration behavior and extracted the detailed effects of surface, interface, and thickness on the vibration energy and intensity [1].

We also probed the localized surface phonon polaritons (SPhPs) in nanostructures. For those materials with the energy of SPhPs generally lying in the far-IR and THz range, their SPhPs have been rarely explored by the scattering-type scanning near-field optical microscopy (SNOM) technique or tip enhanced Raman spectroscopy (TERS) owing to the lack of either suitable light sources or detectors. In contrast, the STEM-EELS technique can excite and probe energy loss for far-IR and part of THz SPhPs. We study the ZnO nanostructures with the SPhPs at about 50-70 meV energy (far-IR range). We observed the tantalizing interference fringes, obtained dispersion relation, and discussed the size and geometry effects. It is demonstrated that the monochromatic STEM-EELS can fill the gap between the mid-IR range and THz range being complementary for common *s*-SNOM technique, providing unprecedented opportunities to understand the lattice vibration behaviors and light-matter interaction in the far-IR range at nanoscale.

July 25 (Thu) 2019 14:00～15:00
Main meeting room at Institute of Engineering Innovation, UT
(工学部総合研究機構　9 号館 1 階　大会議室)
Organizer: Prof. Yuichi Ikuhara, Prof. Naoya Shibata
Phone: 03-5841-7688