SCANNING NEAR-FIELD RAMAN MICROSCOPY ON FERROELECTRICS

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Micro-probed Raman scattering is a one of powerful techniques for the microanalysis of ferroelectric materials. We can easily get information on the position of the sample by focusing an incident laser beam into a spot, which may be 1 micrometer, or less in diameter. Small samples, single domain and local structure have been studied by using the micro-probed Raman scattering near the structural phase transition temperature. Due to diffraction of the light, however, the special resolution is limited to approximately half of the wavelength of the light. Recent advances in near-field optics using the evanescent field have overcome the diffraction limit of light. Unlike the conventional optical microscopy, the resolution depends on the geometry of the probe used. This technique is similar to scanning tunneling microscopy (STM) and atomic force microscopy (AFM).

The near-field optics technology can also be combined with Raman spectroscopy. In order to detect Raman spectra in nanometer scale, several systems have been reported previously: tapered optical fiber, surface enhanced Raman scattering methods and so on. We have developed a new type of scanning near-field Raman scattering system by using a special designed cantilever with aperture. The sample on the conventional AFM piezo-electric transducers was scanned in x-y plain normal to the probe cantilever. Raman scattering spectra of phonons in ferroelectrics will be shown in nanometer scale. The advantage of this system for the study of the ferroelectric phase transition will be discussed with several examples.