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STM and SNOM Type of Scanning Probe Microscopes in the Same Unit: Towards Electrical Modification and Optical Characterization at Nanoscale ILYA SYCHUGOV, NTT Basic Research Laboratories, HIROO OMI, TOORU MURASHITA, YOSHIHIRO KOBAYASHI — Optical and electrical properties of nanostructures can be addressed using radiation or electrical current as a probe. In general, a near-field type of electromagnetic interaction is necessary for an optical probe to enter nanoscale regime. However, a typical scanning near-field microscope utilizes a dielectric fiber tip as an aperture, which makes it unsuitable for electrical measurements. Here, in order to realize both electrical and optical probing at nanoscale, we have combined it with a scanning tunneling microscope (STM). An STM-luminescence (STML) instrument with a conductive and transparent tip, featuring about 40 nm spatial resolution, was reported previously. We have complemented it with a beamsplitter unit in a configuration typical for the fluorescent microscopy. The excitation light is guided through a beamsplitter unit to the indium tin oxide (ITO) tip and the signal is collected via the same fiber transmission line in a spectroscopy mode or in a photon mapping regime. The influence of tip geometry on collection efficiency and spatial resolution as well as limitations of such an instrument are discussed. This approach may find its niche not only for combined electrical and optical measurements, but also for electrical modification with subsequent *in situ* optical probing.

Ilya Sychugov
NTT Basic Research Laboratories

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