Laser-combined STM on nano-structured materials and devices

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We have been developing a microscopy technique that simultaneously realizes the spatial resolution of scanning tunneling microscopy (STM) and the temporal resolution of ultrashort-pulse laser technology, optical pump-probe (OPP) method [1-7]. The combination of STM with optical technology has advantages to enable the analysis of photo-induced dynamics on the nanoscale as well as the realization of ultrafast time-resolved microscopy. In OPP-STM, a non-equilibrium carrier distribution is generated using ultrashort laser pulses and its relaxation processes are probed by STM using the OPP method realized in STM. By combining the microscopy with atom tracking technique, even a single-atomic-level analysis of the carrier dynamics has become possible [5-7]. Furthermore, with the development of a new modulation technique of circularly polarized light, detection of spin dynamics has been realized. The relaxation of spins optically oriented in single quantum wells formed by GaAs/AlGaAs was observed independently. Furthermore, spin precession in GaAs under magnetic field was successfully probed using tunneling current by the time-resolved STM.

Details will be discussed with the recent results at the conference.

References**:**

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