

attoSNOM I: Topography and Force Images

Scanning near-field optical microscopy is the outstanding technique to simultaneously measure the topography and the optical contrast of a sample.

A new low coherence, optical system has been implemented in force detection schemes for scanning near-field optical microscopy applications. The experimental setup of the low coherence inter-ferometric system is presented in Fig. 1. A laser beam is coupled into a single mode fiber which guides the light through a 50/50 coupler directly to a specially prepared SNOM cantilever (Witec system*). The laser beam is partially reflected on the back side of that cantilever and coupled again into the control fiber. The resulting interference fringes are measured by the detector 1, thus providing the measurement of the tip vibration amplitude. The distance between the SNOM tip and the control fiber is typically 2 to 20 microns.

As the tip approaches the sample surface, the cantilever amplitude drops sharply with decreasing tip-sample distance in the nanometer range. The vibration amplitude serves as the input of a feedback loop, which maintains the tip oscillations constant, and consequently the tip-sample forces interactions at a certain level.

The output of the feedback loop is recorded during the scan, providing a topography image simultaneously with the near-field optical image.

The fiber based low coherence system allows characterizing the tip oscillation modes and amplitudes on the one hand, and, on the other hand, performing topographical measurements with a high precision.



Fig. 4: The attoSNOM I microscope sensor head.

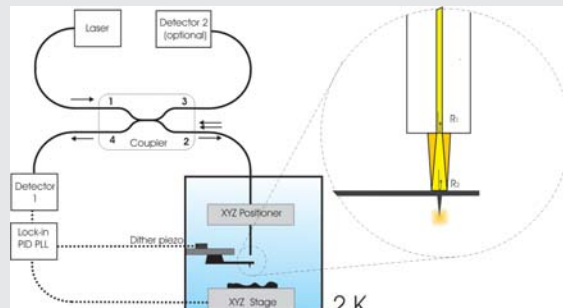


Fig. 1: Schematic drawing of the experimental setup of the sensor system based on low coherence interferometry. R1 (=4%) and R2 (=96%) are the reflection coefficients at the end of the control fiber and the SNOM tip.

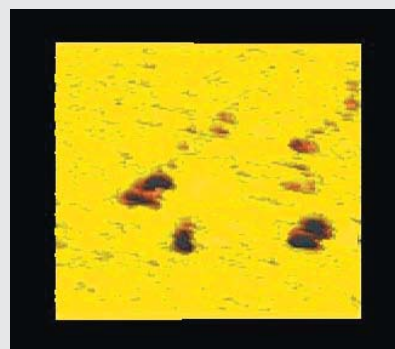


Fig. 2: Optical transmission measurement of a detector glass plate (9x9 microns). Local defects are resolved by the SNOM technique.

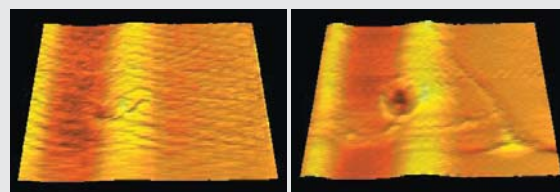


Fig. 3: Topography and optical measurement of a gold grating (4x4 microns). Different local defects are resolved.

RELATED PRODUCTS

attoSNOM I	cantilever based scanning near-field optical microscope
ANPxyz100/LT	high precision, piezo electric, inertial positioner for big loads
ANSxy100	high precision piezoelectric scanner
ANC150/3	electronic controller
ANC200	electronic scan controller
attoSCAN	data acquisition software
attoVIEW	data viewing software