attoSNOM II: Optical Inspection of Waveguides

Scanning near-field optical microscopy (SNOM) allows the measurements of both the topography and the optical contrast of a sample with sub-wavelength resolution. attoSNOM II works by scanning a sub-wavelength sized probe in the near field of a sample surface. The probe consists of a glass tip that can be covered with an opaque metal layer, with a clear nanometric aperture at the tip apex. The near-field fiber based probe acts simultaneously as a topographic sensor and a nanometric optical aperture that records an optical signal.
The attoSNOM has a novel force detection scheme based on an all fiber low-coherence interferometer. The probe-sample distance control mechanism works by detecting the damping of the oscillating tip by sub-pN lateral forces (the so called „shear force“) close to the surface.
The probe oscillation amplitude is measured with a precision better than 100 fm/Hz$^{1/2}$. The oscillation is damped when the probe approaches the sample in the nanometric range due to the „shear force“. Stable feedback in air and fluids is obtained for tip-sample interaction forces below 1 pN. The instrument records simultaneously this force and the optical signal while scanning the probe on the sample surface.

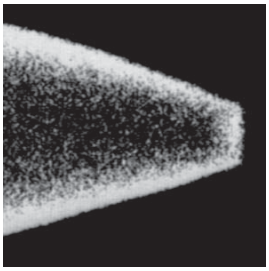

Fig. 1: *SEM micrograph of an attocube systems SNOM tip: a 100 nm thin coating guides the laser light to the end of the tip.*

Fig. 2: *The attoSNOM II microscope sensor head.*

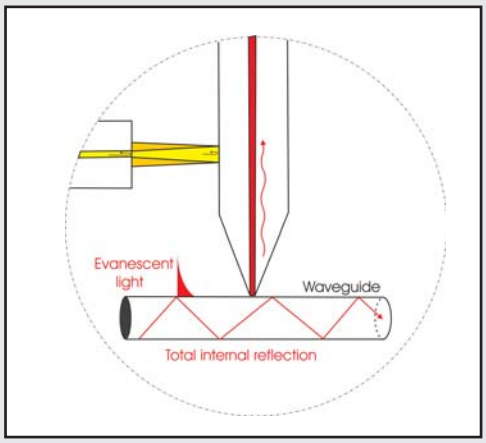

Fig. 3: *Principle of measurement: the optical fiber tip (red beam) is scanned very close to the surface of the waveguide, so that the collection of the emitted evanescent field is possible. The upper fiber (yellow beam) serves as a sensor of the tip vibration (distance control).*

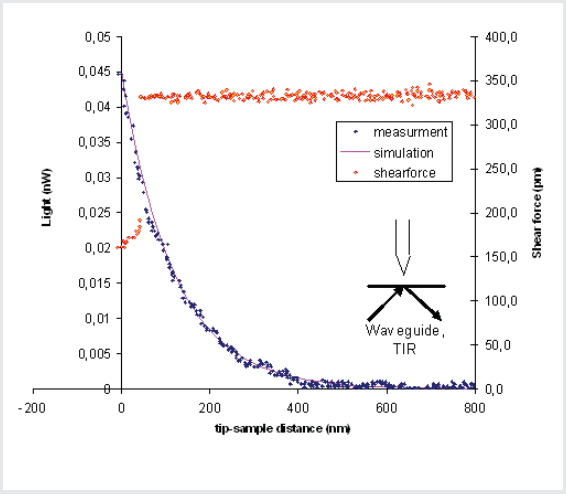

Fig. 4: *Measurement of the evanescent field decay length on the surface of a waveguide. This decay is a function of the effective index of the propagating mode in the waveguide. This method brings the key information when investigating optical waveguides in telecom applications.*

RELATED PRODUCTS

attoSNOM II	all fiber 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

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