

KIT Near-field optics

3. Near-field optics

.....

3.4 Scanning near-field optical microscopy : Methodology

- 3.4.1 Probe concepts and fabrication
- 3.4.2 Surface distance control
- 3.4.3 Optical characterization
- 3.4.4 Artifacts

Nanooptics 19/1

KIT Aperture Probes: Examples

(a)

(b)

(c)

(d)

(e)

(f)

300 nm

500 nm

Hecht, Dissertation (1996)

KIT Characterization of SNOM Probes
by Means of Fluorescent Nano-Spheres

Aperture probe

fluor. bead (20 nm)

Scan

Topography: Height 20 nm

Fluorescence: Intensity

Scan

Topography: Height 20 nm

Fluorescence: Intensity

C. Höppener et al., APL (2002)

KIT Imaging of Fluorescent Nano-Spheres

Sharp AFM tip

AFM

5 μ m

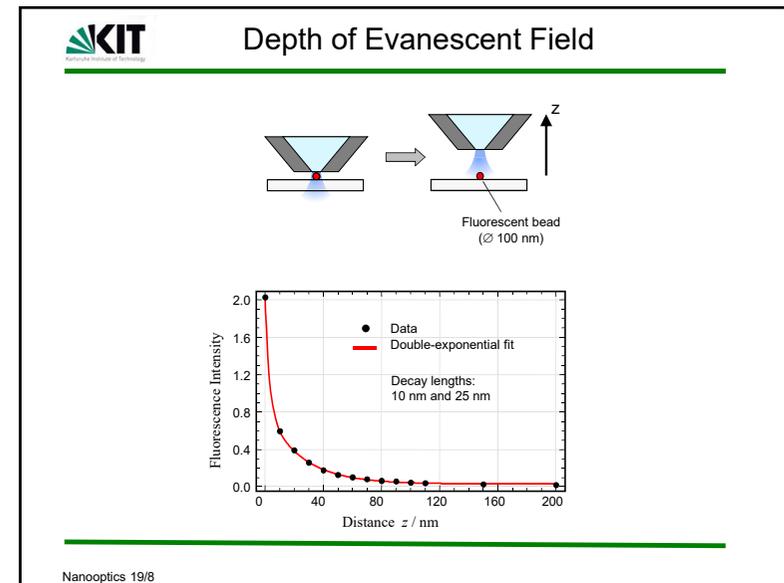
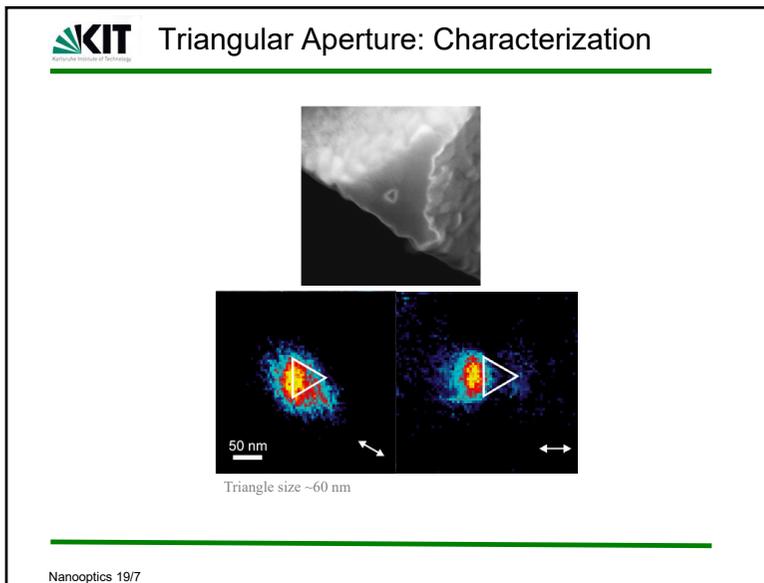
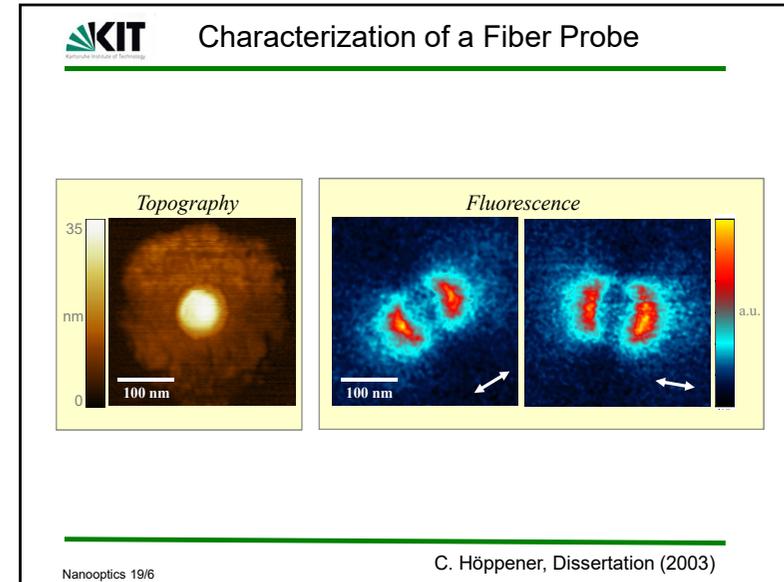
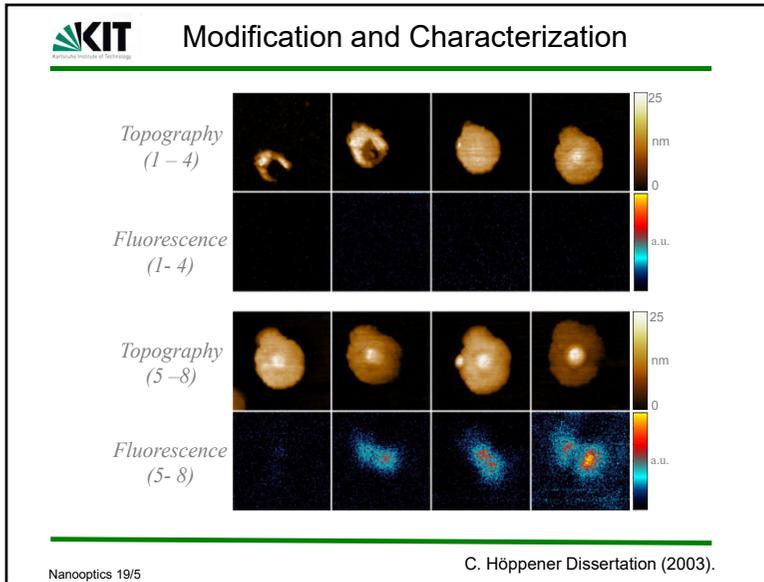
SNOM probe

Fluorescence

3 μ m x 3 μ m

1
a.u.
0

C. Höppener, PhD thesis (2003)



KIT **CdSe Nanocrystals**

Wavelength (nm): 650, 600, 550, 500
 Emission (arb. units)
 Energy (eV): 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5
 Labels: (H), (G), (F), (E), (D), (C), (B), (A)
 Size: (Color scale from small to large)

Nanooptics 19/9 Prof. Weller, Uni Hamburg

KIT **Energy states of a quantum well**

Illustration: energy states of electrons in a quantum well ("particle in a box")

$$E_n = \frac{h^2 n^2}{8mL^2} \quad n = 1, 2, \dots$$

$$E_2 - E_1 = \frac{h^2}{8mL^2} (2^2 - 1^2)$$

Nanooptics 19/10

KIT **Spectroscopic properties of 5-nm-sized CdSe nanocrystals**

Absorption and Emission

534
 CdSe (HDA:TOPO:TOP) D1071a
 Excitation (488 nm)
 Absorbance
 PL intensity / a.u.
 Wavelength / nm

Nanooptics 19/11

KIT **Imaging of QD-Aggregates**

Topography *Fluorescence*

3.5 μ m x 3.5 μ m
 126 nm
 6 nm
 3.5 μ m x 3.5 μ m
 20 nm

Nanooptics 19/12 A. Naber et al., PRL **89**, 210801 (2002)