FIB Based Microfabrication Technique For A Novel Type of Scanning Electrochemical Microscopy Probes
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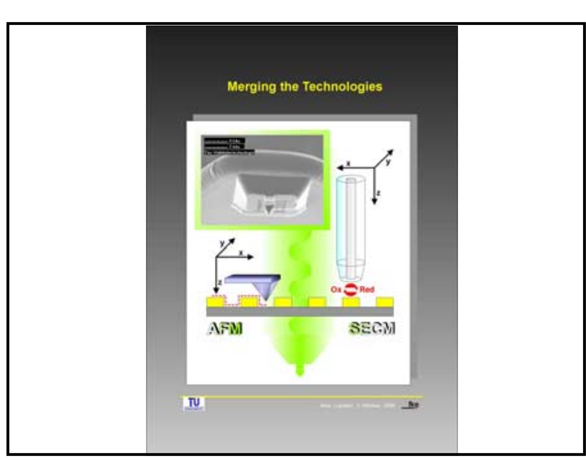

Merging the Technologies
x
y
z
Ox
Red
AFM
SECM
TU
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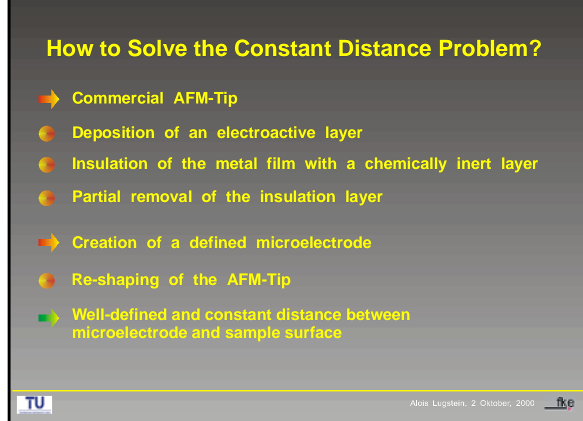

How to Solve the Constant Distance Problem?
Commercial AFM-Tip
Deposition of an electroactive layer
Insulation of the metal film with a chemically inert layer
Partial removal of the insulation layer
Creation of a defined microelectrode
Re-shaping of the AFM-Tip
Well-defined and constant distance between microelectrode and sample surface
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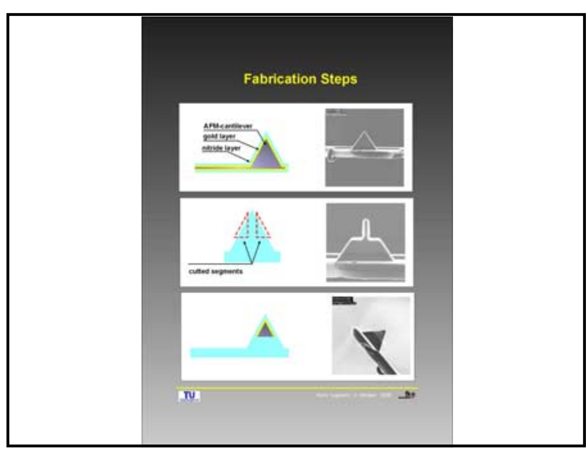

Fabrication Steps
AFM-cantilever
gold layer
nitride layer
cutted segments
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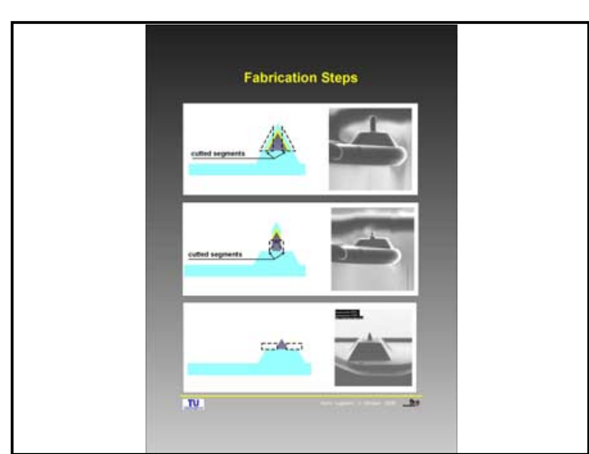

Fabrication Steps
cutted segments
cutted segments
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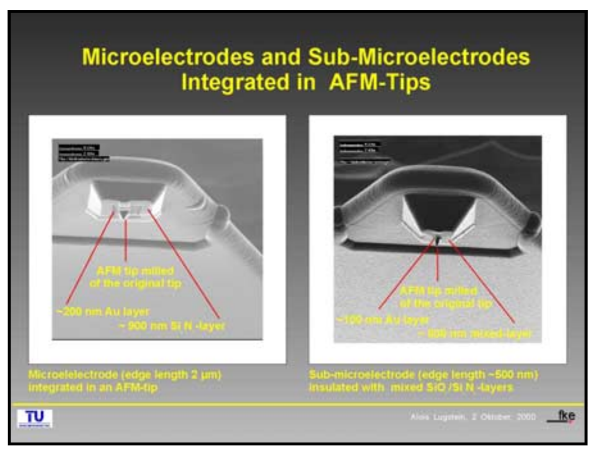

Microelectrodes and Sub-Microelectrodes Integrated in AFM-Tips
AFM tip milled of the original tip
~200 nm Au layer
~ 900 nm Si N -layer
AFM tip milled of the original tip
~100 nm Au layer
~ 800 nm mixed-layer
Microelectrode (edge length 2 µm) integrated in an AFM-tip
Sub-microelectrode (edge length ~500 nm) insulated with mixed SiO /Si N -layers
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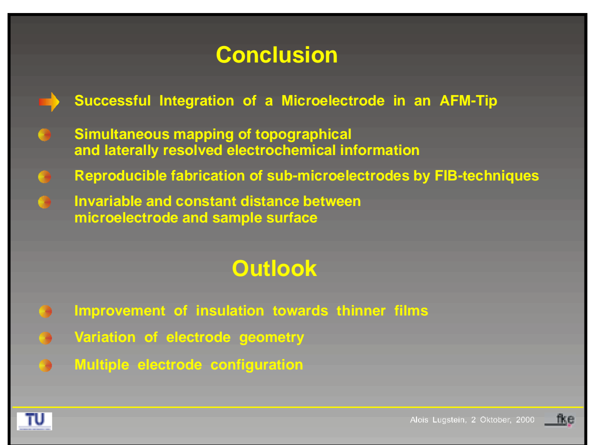
Conclusion
Successful Integration of a Microelectrode in an AFM-Tip
Simultaneous mapping of topographical
and laterally resolved electrochemical information
Reproducible fabrication of sub-microelectrodes by FIB-techniques
Invariable and constant distance between
microelectrode and sample surface
Outlook
Improvement of insulation towards thinner films
Variation of electrode geometry
Multiple electrode configuration
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