

Trilayer Cantilever Probes

Silicon Nitride-Polymer probes for Scanning Probe Microscopy

General description

The Trilayer Cantilevers (TLC) feature a unique structure with Silicon Nitride films and a polymer core, resulting in increased thickness without excessive stiffness. This design significantly amplifies force sensitivity ($\mu\text{V/nN}$), surpassing standard single-crystalline Si cantilevers by a factor of 4x. Due to the low Q-factor of less than 250 (even in a vacuum), the TLC enables scanning speeds up to 10x faster than those achievable with Si or SiN-CL.

Additionally, the electrical insulation of electronic sensors within the SiN/Polymer interface ensures robustness and reliability even in harsh conditions. This feature enables the TLC to function seamlessly in electrically conductive media.

Applications:

- AFM: Integration on standard AFM scanners, high speed AFM
- Force or deflection measurements
- Measurements within TEM, SEM, XPS, etc.
- Measurements in liquids – even opaque or conductive liquids.

What about your application?

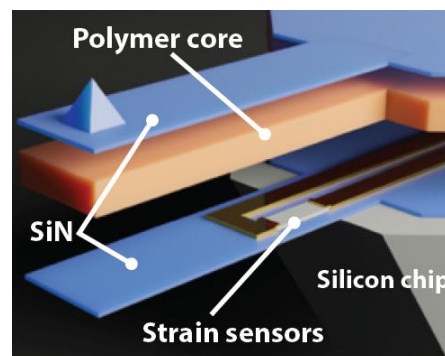
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Specifications			
Model	Trilayer Cantilevers (TLC)		
Material	SiN shell with polymer core		
Tip material	Silicon or Tipless		
Modes	static and dynamic modes		
Nominal Dimensions	Nominal Res. Freq.	Nominal spring const.	Deflection sensitivity*
($\mu\text{m} \times \mu\text{m} \times \mu\text{m}$)	(kHz)	(N/m)	($\mu\text{V/nm}$)
220 x 40 x 4	80	2.5	3
180 x 40 x 4	120	4.5	5
90 x 40 x 4	500	40	19
Deflection sensing	on-chip piezoresistive bridge		
Actuator	external shaker (or upon request: on-chip)		
Electrical connections	bonded to small PCB with connector (counter part PCB available) or delivered as bare chip (bonding pads on-chip)		

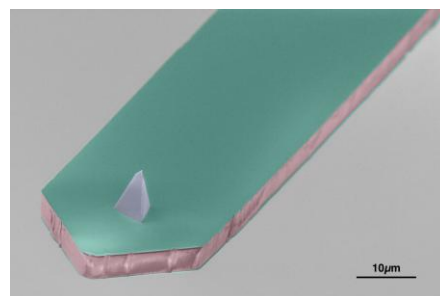
* not amplified (signal direct at the chip), 2.048 V bridge supply

References: Hosseini, N., et al. Nature Electronics

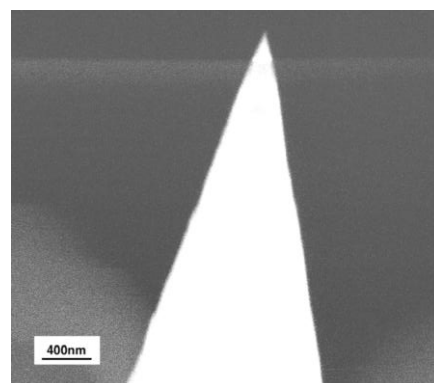
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Schematic of the Trilayer cantilevers



SEM image (colored) of a TLC with Si Tip



SEM image of the Si tip (radius <20nm)

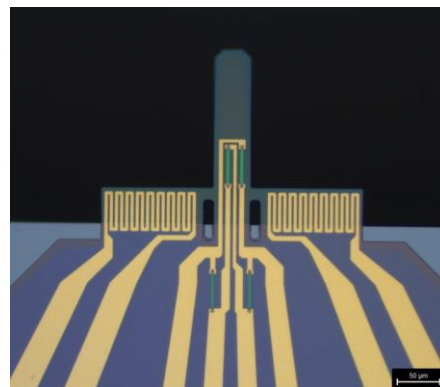


Image of a tipless TLC with integrated heater (optional) for thermal excitation.

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