

## All-diamond NaDiaProbes®

### Introduction

NaDiaProbes are all-diamond probes for advanced AFM-based research. These probes are not diamond coated or diamond-like carbon. In NaDiaProbes both the cantilever and probe tip are made of UNCD® (Ultrananocrystalline Diamond) a patented diamond thin-film made to a monolithic structure.

Some Unique UNCD Material Properties Are:

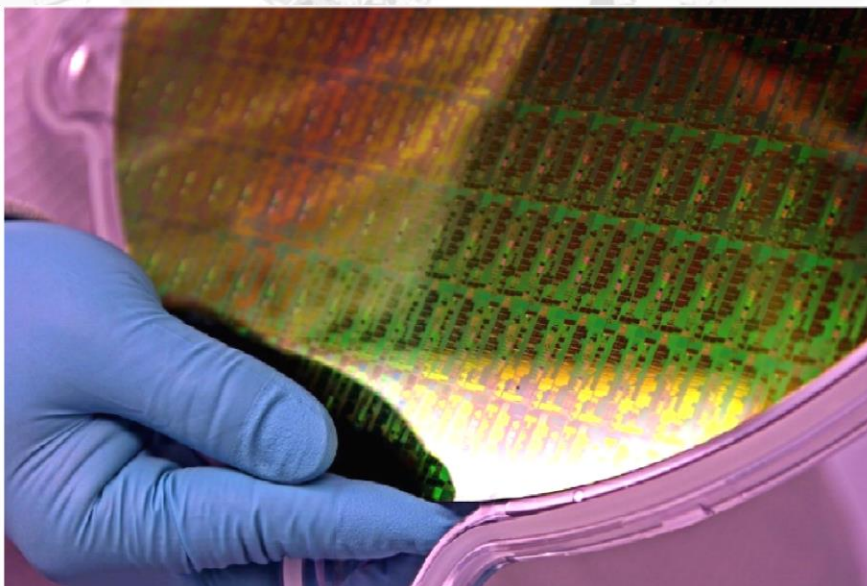
**Mechanical Properties:** Equivalent to natural diamond in hardness, Young's modulus, fracture toughness and strength.

**Tribological Properties:** Smooth UNCD exhibits friction coefficients as low as 0.03 in air.

**Transport Properties:** Some of UNCD films exhibit some of the highest conductivity reported for a phase-pure diamond film and are more conductive than any doped crystalline diamond film or diamond-like carbon film.

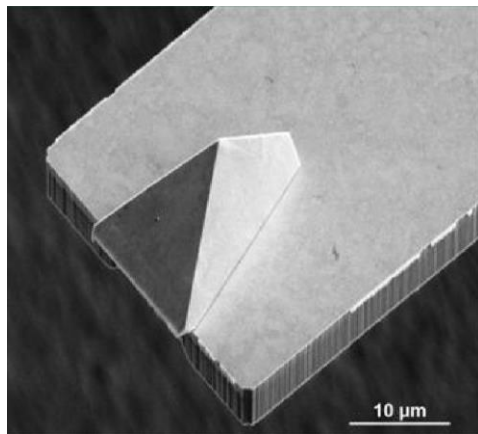
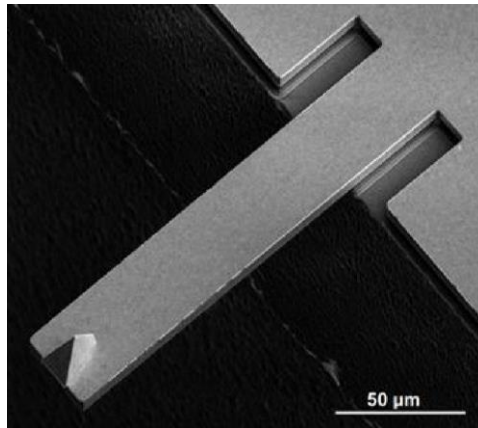
**Electron Field Emission Properties:** UNCD films consistently exhibit very low threshold fields for field electron emission. Emission currents as high as 100  $\mu$ A from a single UNCD-coated silicon micro-tip have been observed. Emission currents as high as 1 mA have been achieved from conformally-coated arrays of silicon microtips.

NaDiaProbes have been used for different type of applications ranging from imaging to nanoindentation. Contact us for any inquiries about these probes that bring unprecedented dimensional stability for nanoscale imaging, metrology and Nano manufacturing. NadiaProbes are designed to fit most commercial AFM instruments.



## NadiaProbes: Scanning Spreading Resistance Microscopy

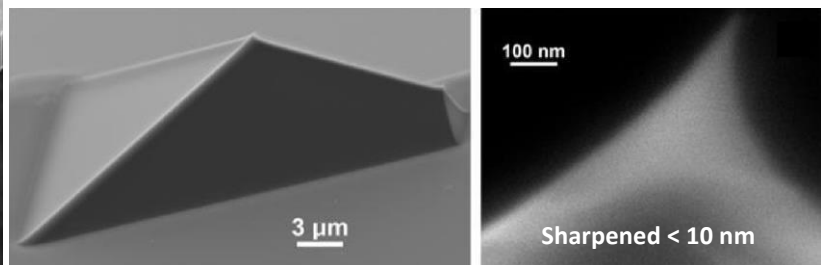
**Product: P-SSCR series, three-sided (for non-contact, contact on hard surfaces, Indentation)**



These probes are designed for Scanning Spreading Resistance Microscopy (SSRM) which enables simultaneous topographic imaging and 2D carrier density mapping on the surface of semiconductor samples. In addition these probes can be used for nano-indentation and nano-scratching applications. These probes can be used for imaging in contact mode, in air, liquid, on hard surfaces and non-contact mode.

**Here are the properties of these tips:**

- **Extreme hardness**, for indenting many surfaces
- **Extreme wear resistance**, no change after many scans
- **Extremely strong**, as strong as a single-crystal diamond
- **Very low friction**, coefficients of friction 0.03 in air
- **Low stickiness**, Hydrophobic surface

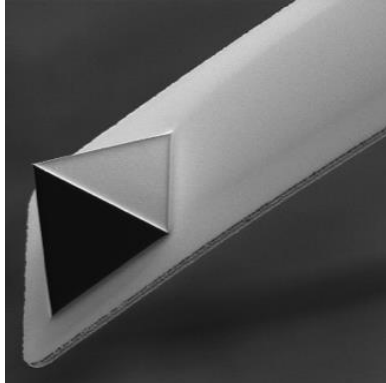


Item #	Force Constant (N/m)			Frequency (kHz)			Length (µm)	Width (µm)	Thickness (µm)
	Nominal	Min.	Max.	Nominal	Min.	Max.	(± 5)	(± 2)	(± 0.5)
P-SSCRS	27	13	35	265	150	355	130	33	2.3
P-SSCRL	5.5	4	7	80	50	110	245	42	2.3

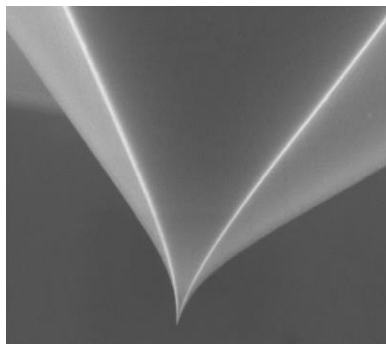
Tip		Cantilever	
Shape	Three-sided pyramid	Tip Setback	9 µm
Height	5.7 µm (± 0.1)	Coating	70nm (± 10) reflective aluminum coating
ND (regular)	Radius less than 50 nm	Chip	Pyrex (3.6 x 1.5 x 0.5 mm)
Material	Conductive UNCD	Curvature	Nominally less than 3 degrees
AD (sharpened)	Radius less than 10 nm	Shape	Rectangular

## NaDiaProbes: Conductive Contact Mode

**Product: P-CTC series, four-sided (for contact on soft surfaces)**



These probes are designed for conducting scanning probe microscopy (C-AFM), Oxidation lithography, E-Chem AFM, Piezo-Force microscopy and SSRM. These probes feature high electrical conductivity and they are not like the metal coated probes. These probes are totally conductive. Additionally, the apex of less than 10 nm radius is respectively sharp when compared to the metal coated probes which gives unprecedented topographic and electrical resolution.



**Here are the properties of these tips:**

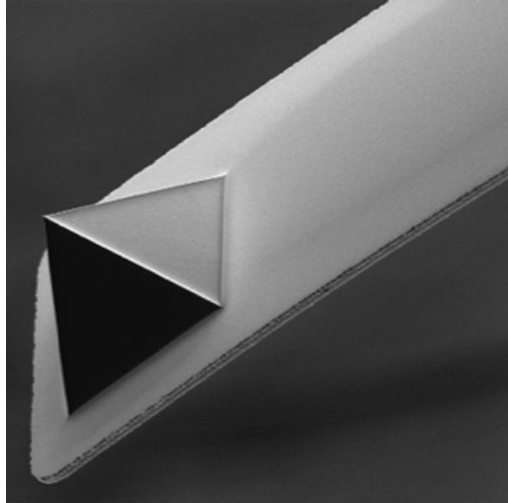
- **No tip wear/Extremely durable**
- **No tip shape degradation**
- **Low friction**
- **Suitable for bio-applications**
- **Enables unparalleled resolution**

Item #	Force Constant (N/m)			Frequency (kHz)			Length (μm)	Width (μm)	Thickness (μm)
	Nominal	Min.	Max.	Nominal	Min.	Max.	(± 5)	(± 2)	(± 0.5)
P-CTCT2S	0.71	0.05	0.95	50	25	75	200	17	1
P-CTCT2L	0.04	0.02	0.05	23	12	45	300	23	1
P-CTCR1S	0.35	0.25	0.45	35	20	50	225	30	1
P-CTCR1M	0.17	0.1	0.25	17	10	25	325	40	1
P-CTCR1L	0.04	0.02	0.05	12	6	20	425	20	1

	Tip		Cantilever
<b>Shape</b>	Four-sided pyramid	<b>Tip Setback</b>	9 μm
<b>Height</b>	5.7 μm (± 0.1)	<b>Coating</b>	70nm (± 10) reflective aluminum coating
<b>ND (regular)</b>	Radius less than 50 nm	<b>Chip</b>	Pyrex (3.6 x 1.5 x 0.5 mm)
<b>Material</b>	Conductive UNCD	<b>Curvature</b>	Nominally less than 3 degrees
<b>AD (sharpened)</b>	Radius less than 10 nm	<b>Shape</b>	CTCTR1 Rectangular / CTCT2 Triangular

## NaDiaProbes: Conductive Non-Contact Mode

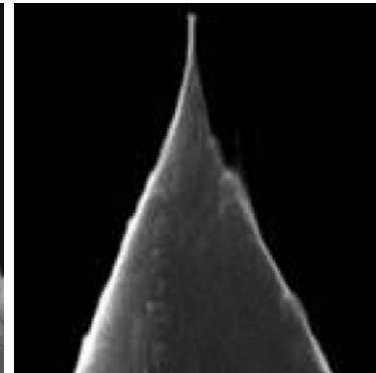
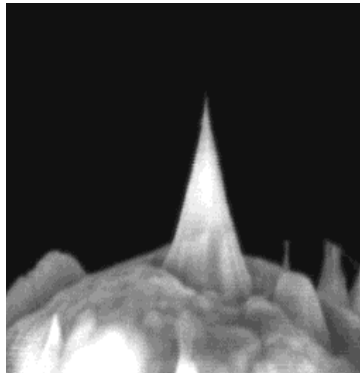
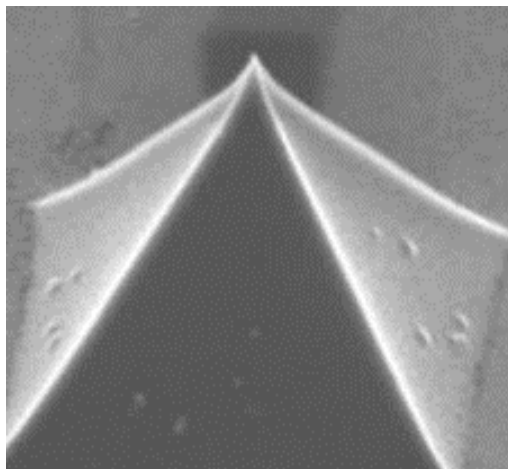
**Product: P-CYCR series, four-sided (Non-Contact, Contact on hard surfaces, Indentation)**



These probes are designed for non-contact imaging, C-AFM, oxidation lithography, nano-indentation and nano-scratching applications. Can be used also for imaging in contact mode in air or liquid on hard surfaces.

**Here are the properties of these tips:**

- **Extreme hardness**, for indenting many surfaces
- **Extreme wear resistance**, no change after many scans
- **Extremely strong**, as strong as a single-crystal diamond
- **Very low friction**, coefficients of friction 0.03 in air
- **Low stickiness**. Hydrophobic surface



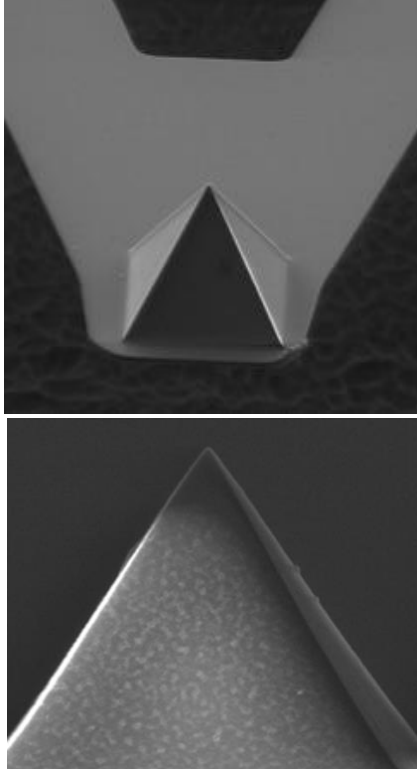
Item #	Force Constant (N/m)			Frequency (kHz)			Length (μm)	Width (μm)	Thickness (μm)
	Nominal	Min.	Max.	Nominal	Min.	Max.	(± 5)	(± 2)	(± 0.5)
P-DYCRS	35	25	40	310	150	400	135	33	3

Tip		Cantilever	
Shape	Four-sided pyramid	Tip Setback	8.5 μm
Height	5.7 μm (± 0.1)	Coating	70nm (± 10) reflective aluminum coating
ND (regular)	Radius less than 50 nm	Chip	Pyrex (3.6 x 1.5 x 0.5 mm)
Material	Conductive UNCD	Curvature	Nominally less than 3 degrees
AD (sharpened)	Radius less than 10 nm	Shape	Rectangular



## Probes-nanoDiamond: Contact Mode

**Product: P-CTIT series, four-sided**



These probes are designed for contact imaging on soft material. Thanks to their ultra-small diamond structure, their surfaces are extremely smooth and exhibit low friction, yet they retain the extreme wear and chemical resistance and inertness, which is critical when imaging soft material.

**Here are the properties of these tips:**

- **Scanning soft and hard surfaces in contact mode**
- **Quality control**
- **Long tip life time**
- **Bio friendly** due to its low surface energy which leads to superior imaging performance on soft, sticky samples such as protein, polymers, DNA, viruses, bacteria and cells
- **Resist fouling** and build-up of debris when imaging soft material
- **Low friction** which inhibits sample damage during imaging

Item #	Force Constant (N/m)			Frequency (kHz)			Length (μm)	Width (μm)	Thickness (μm)
	Nominal	Min.	Max.	Nominal	Min.	Max.	(± 5)	(± 2)	(± 0.5)
P-CTIT2S	0.71	0.5	0.95	50	25	75	200	17	1
P-CTIT2L	0.04	0.02	0.05	23	12	45	300	23	1

Tip		Cantilever	
Shape	Four-sided pyramid	Tip Setback	9 μm
Height	5.7 μm (± 0.1)	Coating	70nm (± 10) reflective aluminum coating
ND (regular)	Radius less than 50 nm	Chip	Pyrex (3.6 x 1.5 x 0.5 mm)
Material	UNCD	Curvature	Nominally less than 3 degrees
Radius (sharpened)	not available	Shape	Triangular

### Ordering information:

Learn more about ACST products and services at [www.acs-t.com](http://www.acs-t.com). Use the request a quote section on our website to request a quote, order online or simply send your inquiries to [clientservices@acs-t.com](mailto:clientservices@acs-t.com)