

UNCD[®] Horizon™ Wafers—Ultra-Smooth Diamond

A generational leap in diamond wafer technology



Advanced Diamond Technologies, Inc. (ADT), introduces UNCD[®] Horizon™, the world's smoothest vapor-deposited diamond, to its family of award-winning diamond products. UNCD Horizon represents a generational leap in diamond wafer technology that brings the surface roughness of diamond films to levels comparable to electronic grade silicon wafers; opening up new vistas for the application of diamond into a wide variety of electronic and biomedical devices.

Using a standard semiconductor processing technique, chemical mechanical planarization (CMP), ADT transforms its already thin, smooth diamond material UNCD into an ultra-smooth surface for UNCD Horizon, improving the smoothness by an order of magnitude over ADT's already smooth UNCD products. UNCD Horizon has shown the ability to deliver nano imprint lithography feature sizes on the order of a few nanometers, and orders of magnitude increases in the quality of a diamond MEMS resonator. For industry, UNCD Horizon puts limitless possibilities on diamond's horizon.



ADT Logo patterned on UNCD Horizon
Courtesy of Dr. Warren McKenzie, University of New South Wales

UNCD Horizon Applications

UNCD Horizon's ultra-smooth surface enables many applications, including:

- RF MEMS resonators
- Nanoimprint lithography
- Nanophotonic devices
- Biosensors
- Biomedical devices

Specifications

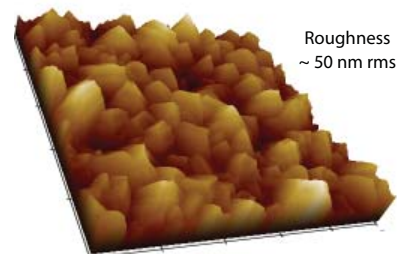
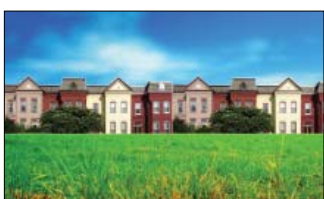
Less than 1 nm roughness across the wafer as measured on 5×5 micron scans using a dynamic mode high frequency imaging rate.



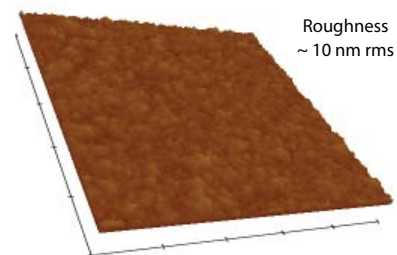
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The Innovation of Horizon

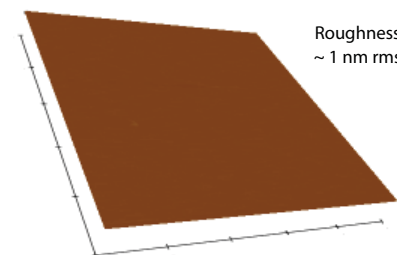
Historically, using chemical vapor deposited (CVD) diamond in an industrial application yields an extremely rough diamond surface. For example, the industrial diamond used for many cutting tool applications is hundreds of microns in roughness. If imaged at the nanoscale, traditional industrial rough diamond films would resemble a jagged skyline of huge skyscrapers (see image at upper left). Less than a decade ago, Advanced Diamond Technologies commercialized an innovative thin, smooth CVD diamond technology called UNCD. Compared to the skyscrapers of industrial diamond, the roughness of UNCD would be like small row houses (image at center left) yet retains all of the phenomenal properties of diamond. Enter the next diamond innovation: UNCD Horizon. Compared to even the relatively smooth surface of UNCD, UNCD Horizon is like a flat prairie (image at lower left). And still UNCD Horizon retains all of the physical properties of natural diamond. To produce UNCD Horizon, the standard semiconductor processing technique of chemical mechanical planarization is employed, which enables UNCD's use in any semiconductor fabrication sequence. Along with meeting industrial fabrication specifications for wafer bow and particle counts, and diamond's ability to be patterned using standard photolithography tools, diamond now truly becomes an engineering material for industrial, medical and semiconductor applications.



UNCD Aqua 100



UNCD Aqua 25



UNCD Horizon 25

UNCD Horizon Product List

UNCD Horizon is currently available in the following products. If you would like a product not shown here, please contact ADT for further details. Prices can be found at the website below.

SKU (All are Horizon 25)	Size	UNCD Wafer Thickness (+/- 20%)	Type
HA25-100-0-2	100 mm Wafer	2 μm	DoSi (diamond on silicon)
HA25-100-0-1	100 mm Wafer	1 μm	DoSi (diamond on silicon)
HA25-001-0-2	1 cm ² die	2 μm	DoSi (diamond on silicon)
HA25-001-0-1	1 cm ² die	1 μm	DoSi (diamond on silicon)
HA25-001-1-p3	1 cm ² die	300 nm	DOI (diamond on insulator)
HA25-001-0-p2	1 cm ² die	200 nm	DoSi (diamond on silicon)
HA25-001-0-p1	1 cm ² die	100 nm	DoSi (diamond on silicon)

UNCD Wafers specifications: Thickness ± 20%, thickness uniformity typically <10%, surface roughness Horizon 25 is <1 nm rms (dynamic 5x5 micron scan), Electrical resistivity of UNCD Lightning™ 25 is <1 ohm-cm, wafers will have no blemishes or particulates visible to naked eye, exclusion zone within 5 mm of edge. Base wafers specifications: prime grade, <100> Si wafer base, 500 μm ± 50 μm, DOI contain 1 μm of thermal SiO₂ on whole wafer, back and front side.

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This product is protected by one or more of the
following U.S. and foreign patents: 5,989,511;
6,592,839; 7,128,889; 5,849,079; 5,772,760.
Additional patents pending.

www.thindiamond.com