

MINE 2005 micro & nano - graph Contest

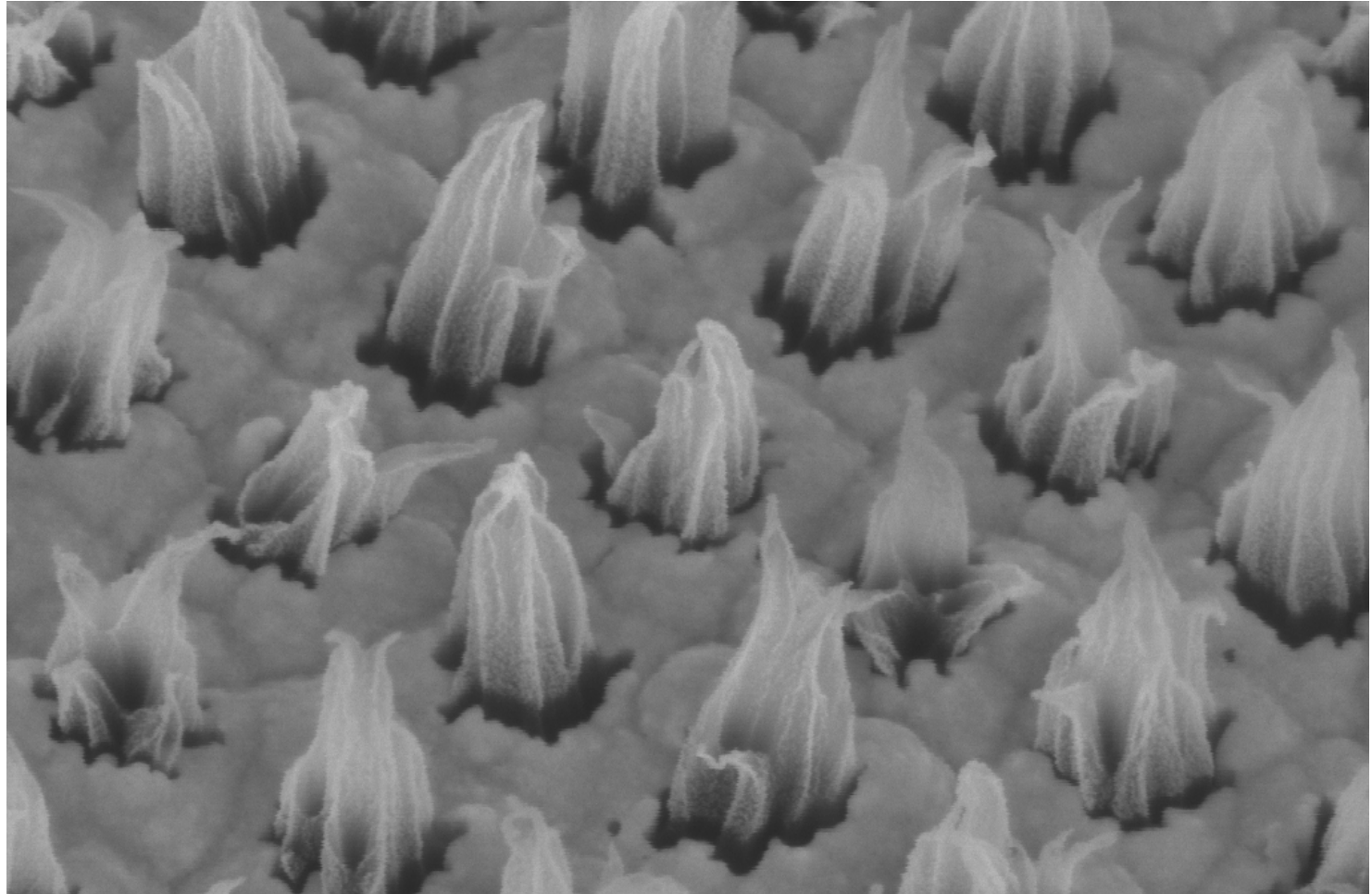


micro & nano - graph
Title:

Peaks

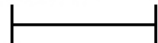
Description:

Electroplated gold
around reactive ion
etched polyimide.



Mag = 100.00 K X

200nm



EHT = 5.00 kV

WD = 6 mm

Signal A = InLens

Photo No. = 5460

Date :13 May 2005

Time :10:25

Magnification: **100.000**

Submitted by: **Janne Laukkanen**

Instrument: **Leo SEM 1550**

Affiliation: **InFotonics Center, University of Joensuu,
Finland**

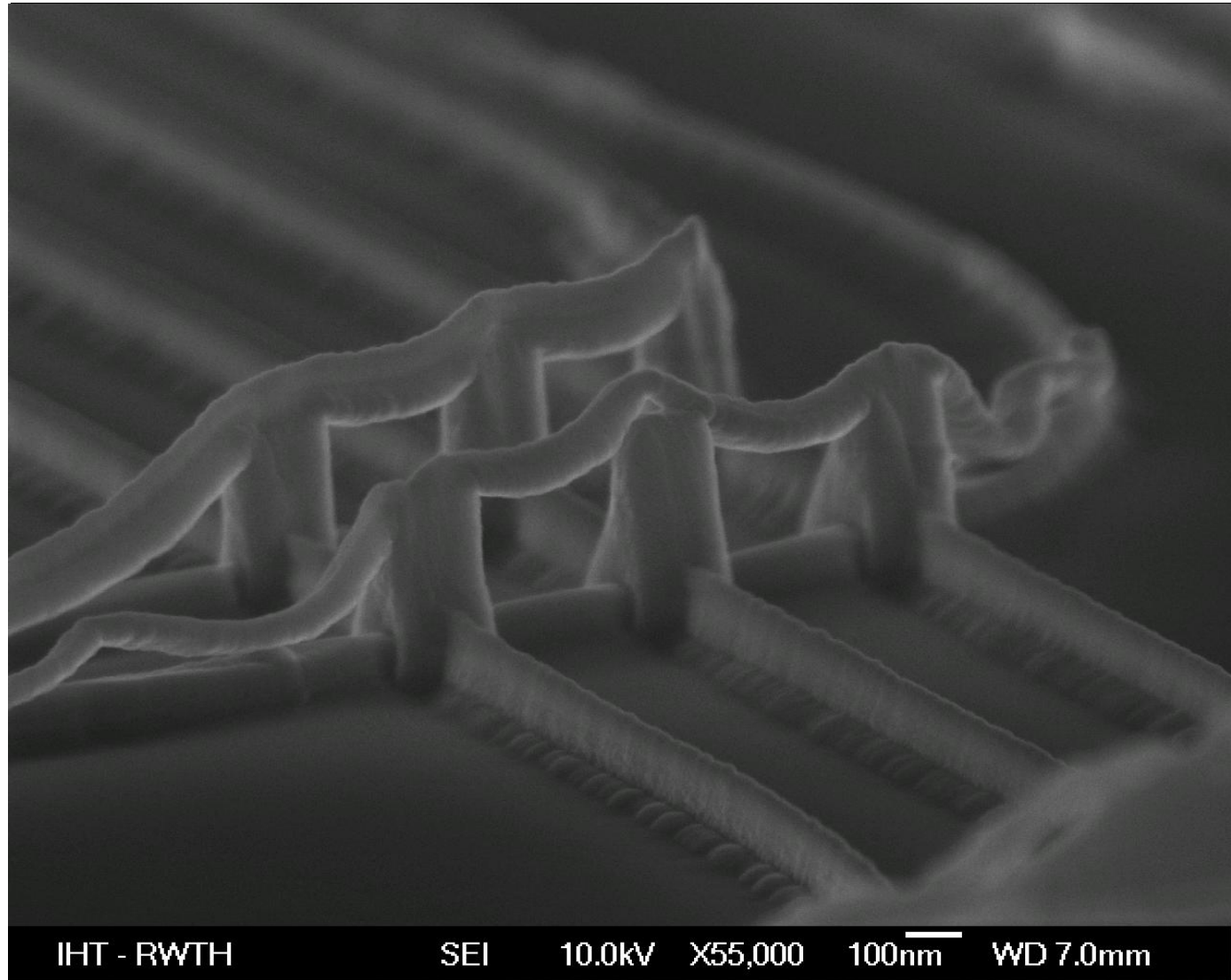


micro & nano - graph
Title:

Double Lane Electronic Traffic

Description:

After an accidental lift-off of e-beam defined FO_x -lines on SOI-substrate with subsequent ion-etching and SiO_2 -sputter deposition the following structures were observed:



Magnification: **X55000**

Submitted by: **Birgit Hadam**

Instrument: **JEOL JSM 6700F**

Affiliation: **Institut für Halbleitertechnik (IHT), RWTH Aachen, Germany**

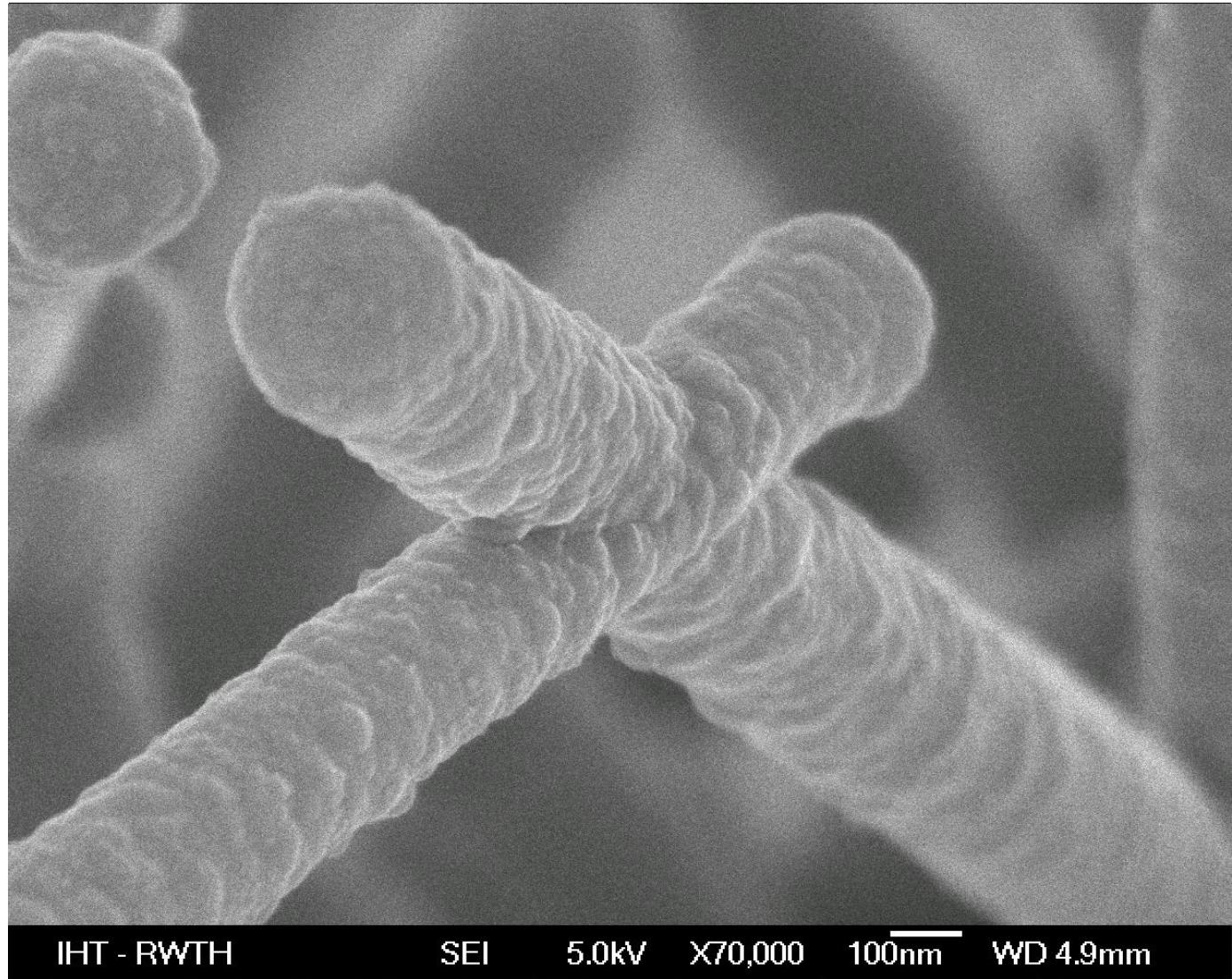


micro & nano - graph
Title:

The Si-X-chromosome

Description:

The Si-X-chromosome merged during the CVD growth of silicon nanowires from an unpatterned substrate decorated with Au nanoparticles.

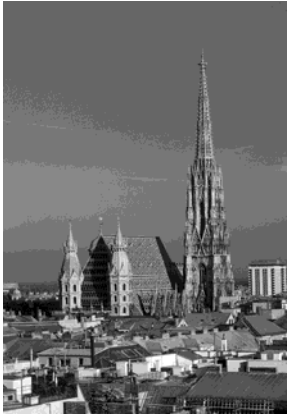


Magnification: **X70000**

Submitted by: **Birgit Hadam**

Instrument: **JEOL JSM 6700F**

Affiliation: **Institut für Halbleitertechnik (IHT), RWTH Aachen,
Germany**

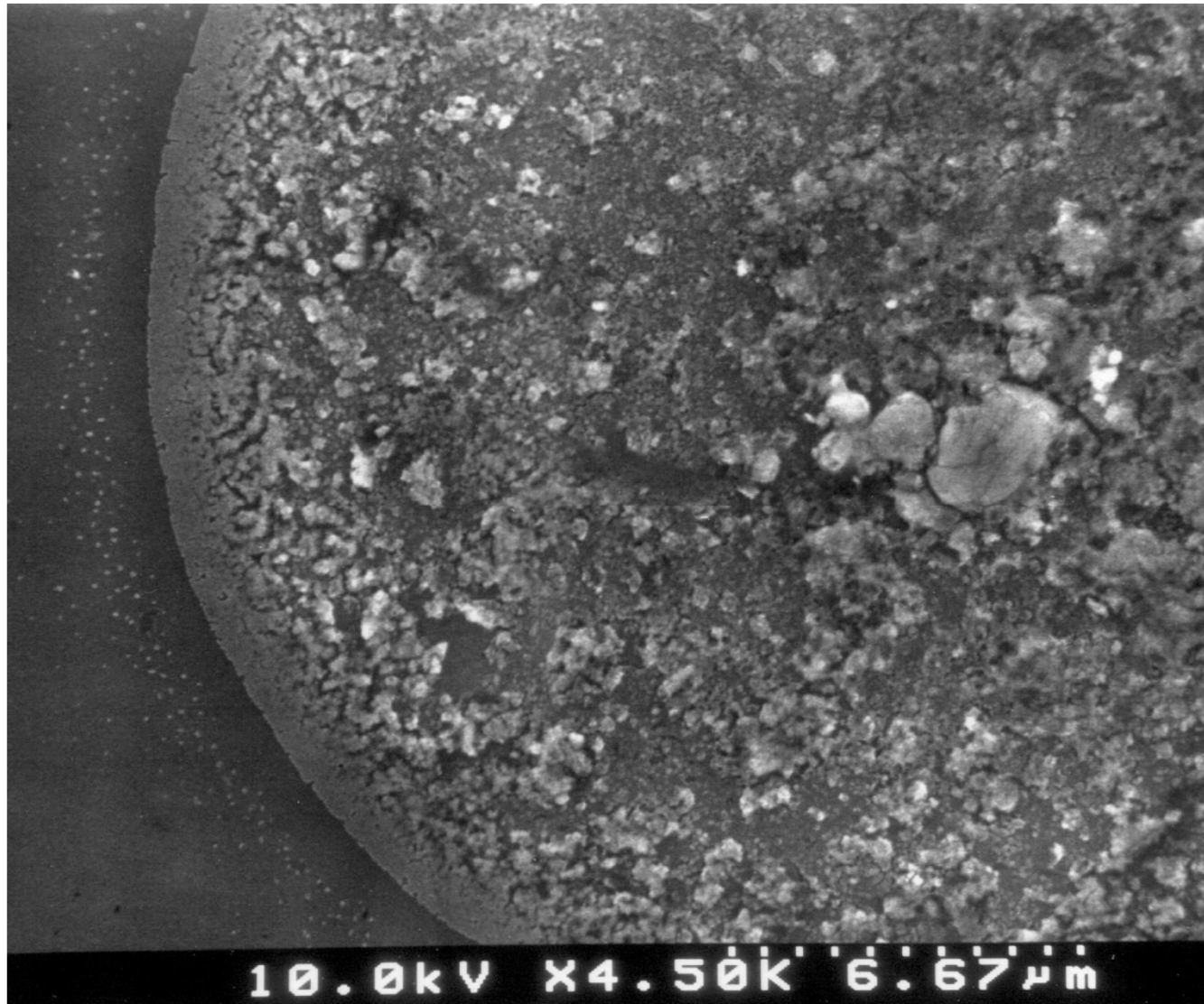


micro & nano - graph
Title:

Micro Mars

Description:

A round dust on a Si wafer was spotted by a Hitachi S4000 SEM, which shows huge similarity to the Mars with many other stars around her.

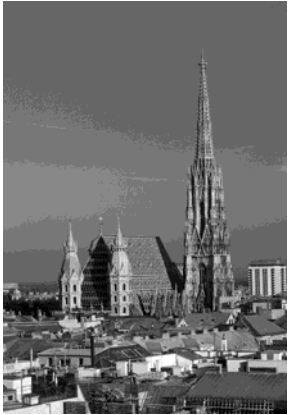


Magnification: 4.5 k

Submitted by: Yifang Chen,
Jiarui Tao and Zheng Cui

Instrument: Hitachi S4000 scanning electron microscope

Affiliation: Central Microstructure Facility
Rutherford Appleton Laboratory, UK

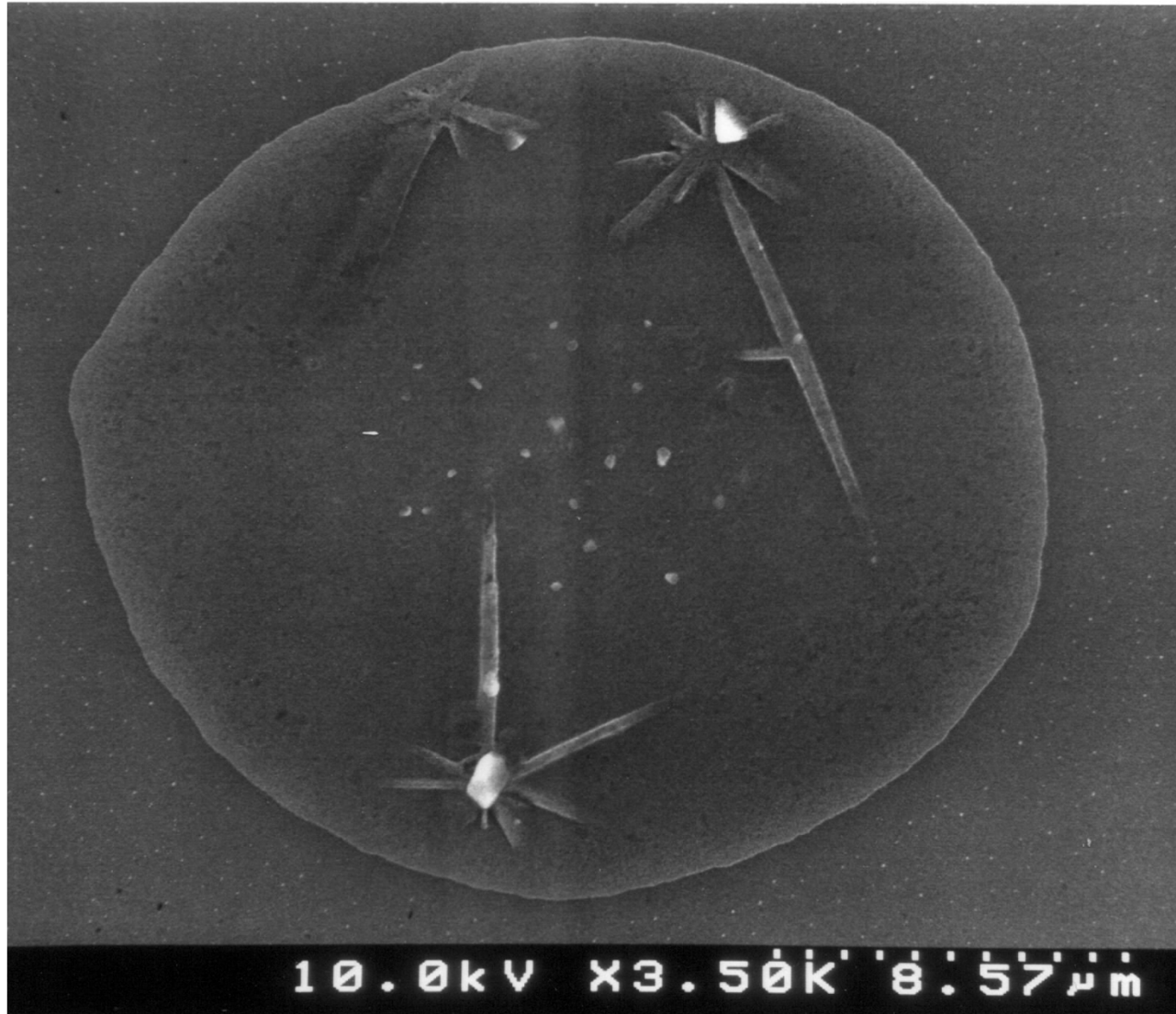


micro & nano - graph
Title:

Micro Moon

Description:

A dirty mark caused by a dried acetone droplet on a Si wafer, which looks like the moon with three meteorites flying to its surface at night.



Magnification: 3.5 K

Submitted by: Yifang Chen,
Jiarui Tao and Zheng Cui

Instrument: Hitachi S4000 scanning electron microscope

Affiliation: Central Microstructure Facility
Rutherford Appleton Laboratory UK

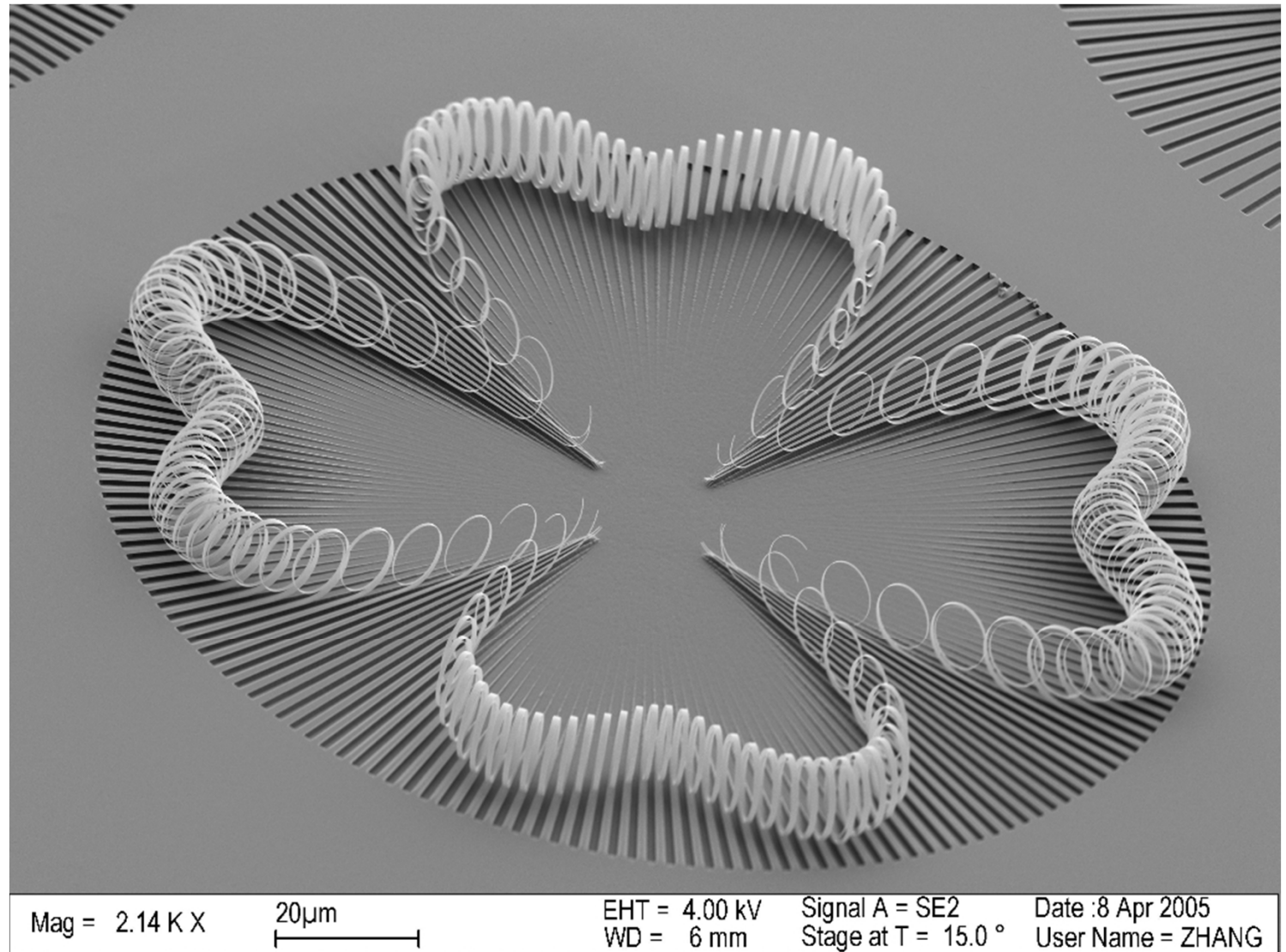


micro & nano - graph
Title:

Four-Leaf Clover

Description:

Si/Cr bilayer has been patterned into a "Siemensstern" with rotational symmetry on Si substrate. After selective etching of the substrate underneath, the rings formed owing to the tensile strain of the Cr layer.



Magnification: 2.14KX

Submitted by: Li Zhang

Instrument: Zeiss SUPRA 55VP

Affiliation: Paul Scherrer Institute
Switzerland



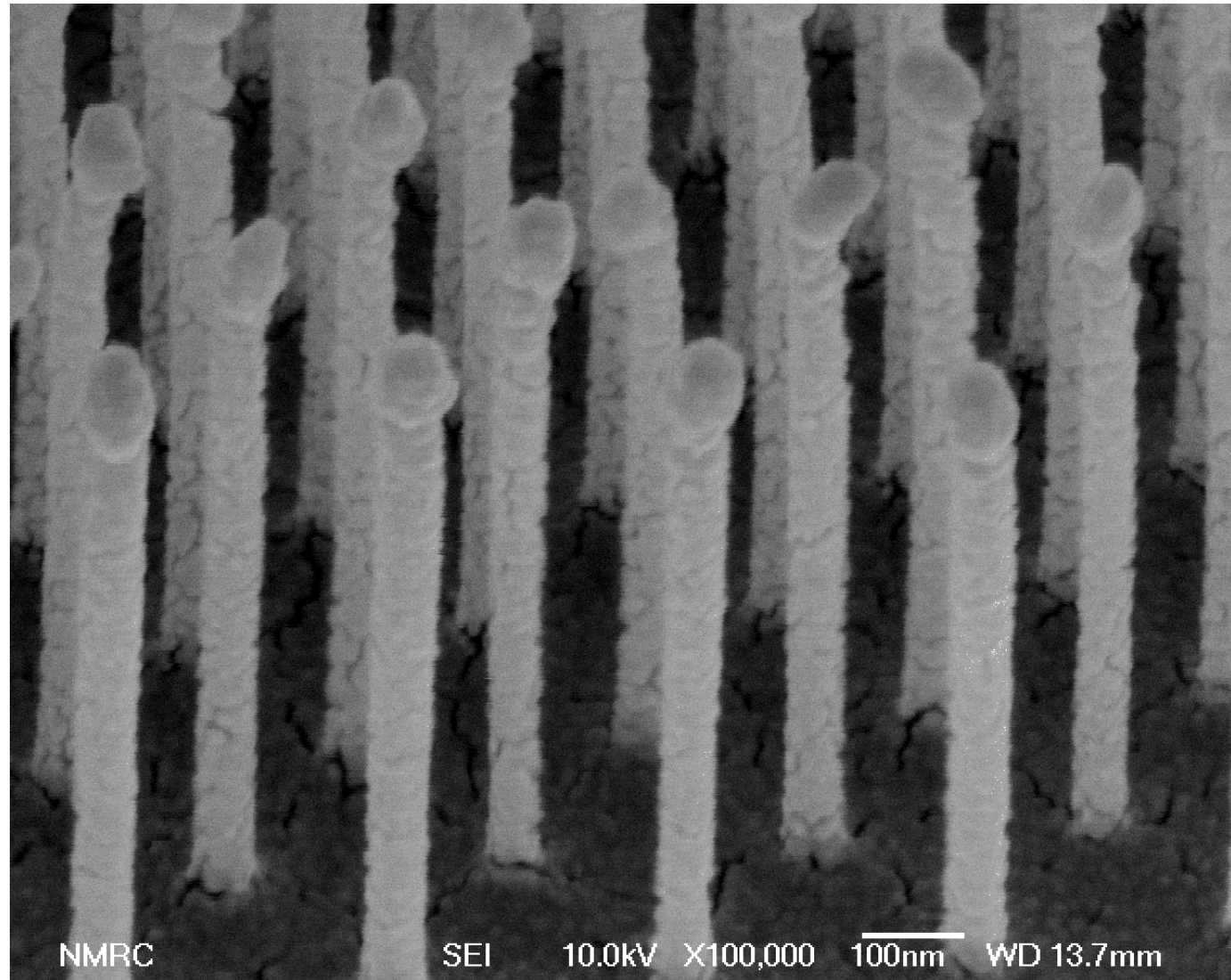
micro & nano - graph

Title:

Nanopillars

Description:

SEM picture of an Si nanopillars array coated with few nm gold, obtained during sabbatical year (2004) in the Tyndall Institute (former NMRC) in Cork, Ireland. The process to get these pillars (800nm high and 50nm in diameter) is robust and industrial. The main processing steps were ebeam litho (Jeol JBX6000 + ZEP resist) and a special DRIE steps (STS-HRM).



Magnification: **100k**

Submitted by: **Cyrille Hibert**

Instrument: **Jeol JSM 6700F**

Affiliation: **EPFL Center of MicroNanoTechnology
Switzerland**

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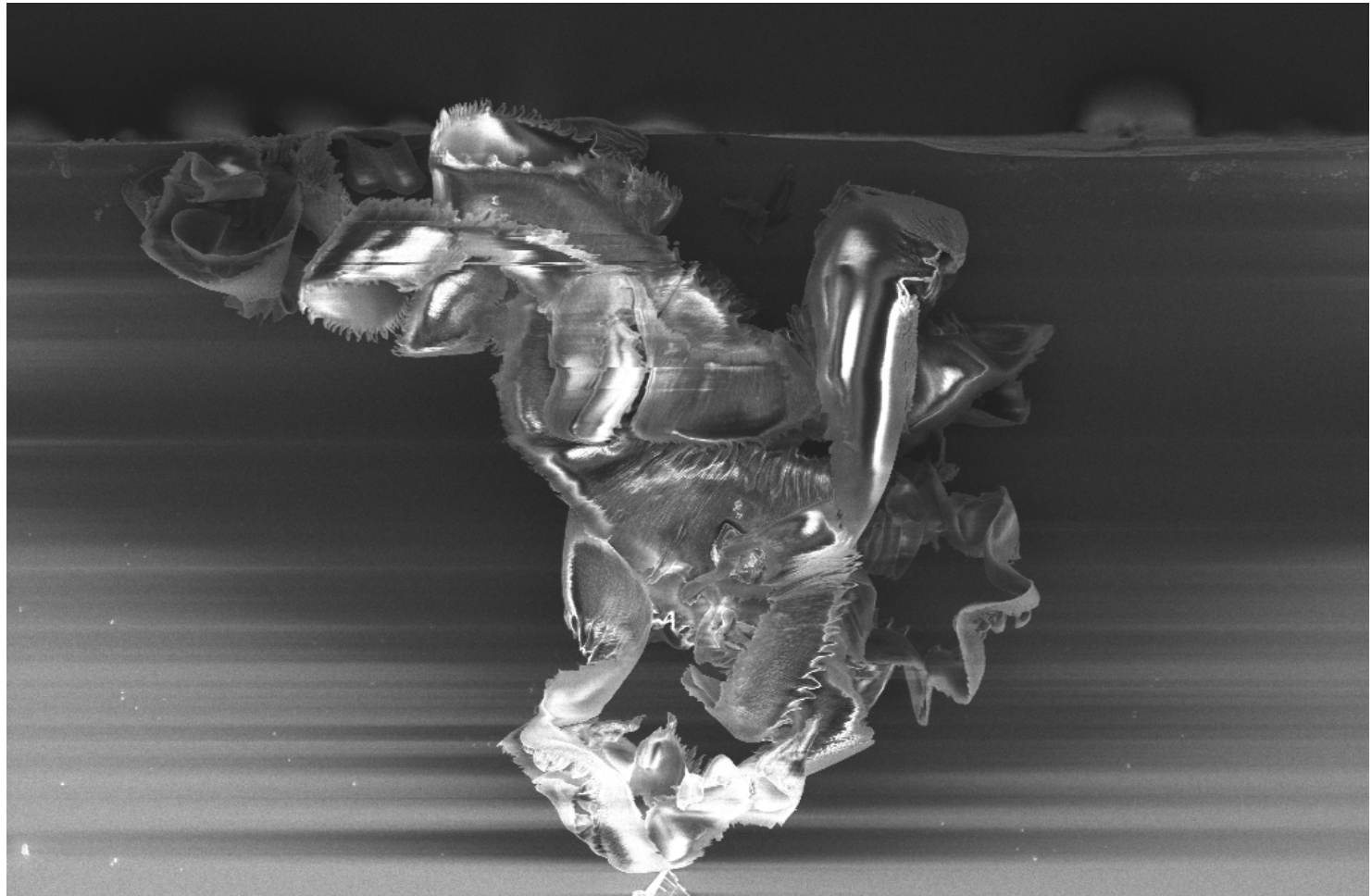


micro & nano - graph
Title:

Micro Pegasus

Description:

Folded aluminum sheet obtained after wafer cleaving. The abstract picture could show a pegasus horse running, the effect of speed is enhanced by the horizontal strips.



Mag = 3.04 K X | 10µm

EHT = 3.00 kV

Signal A = InLens

Date :11 Mar 2005

WD = 6 mm

Stage at T = 0.0 °

File Name = cmp_150.tif

EPFL-CMI

Magnification: **3.04k**

Submitted by: **Nicolas Abelé**

Instrument: **Leo SEM 1550**

Affiliation: **EPFL, Electronics laboratories – LEG
Switzerland**

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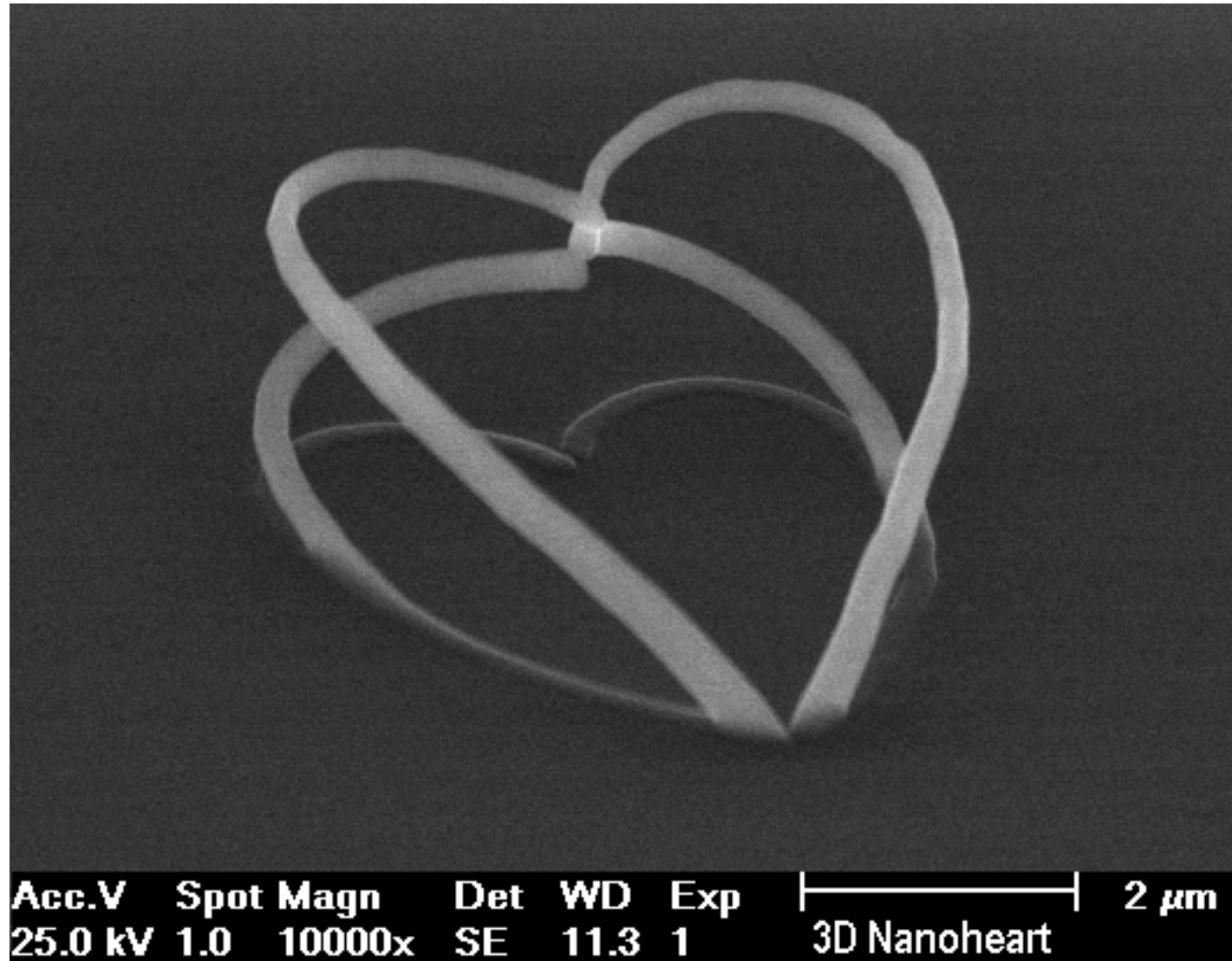


micro & nano - graph
Title:

3D Nanoheart

Description:

Focused electron
beam induced
deposition of Rh-
containing composite



Magnification: **10.000k**

Submitted by: **Tristan Bret**

Instrument: **Philips XL30 FEG**

Affiliation: **Institute of Applied Optics, Ecole Polytechnique
Fédérale de Lausanne, Switzerland**



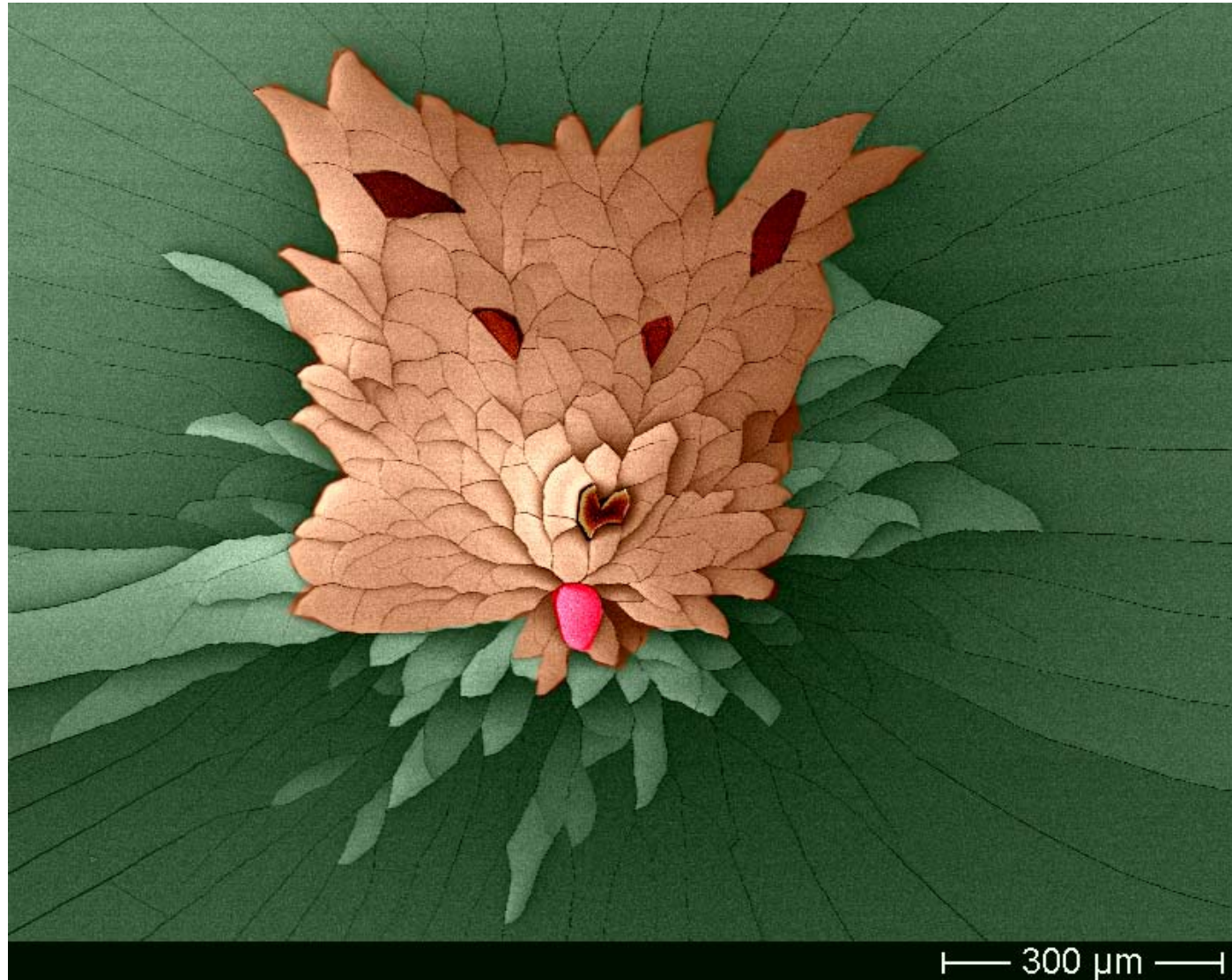
micro & nano - graph
Title:

Micro-Fox

Description:

Broken part of an alumina film on an aluminum substrate.

(recolored SEM photo)



Magnification: **100k**

Submitted by: **Mato Knez**

Instrument: **JEOL JSM6300 (Acc. Voltage: 5 kV)**

Affiliation: **Max-Planck-Institut fuer Mikrostrukturphysik
Halle, Germany**

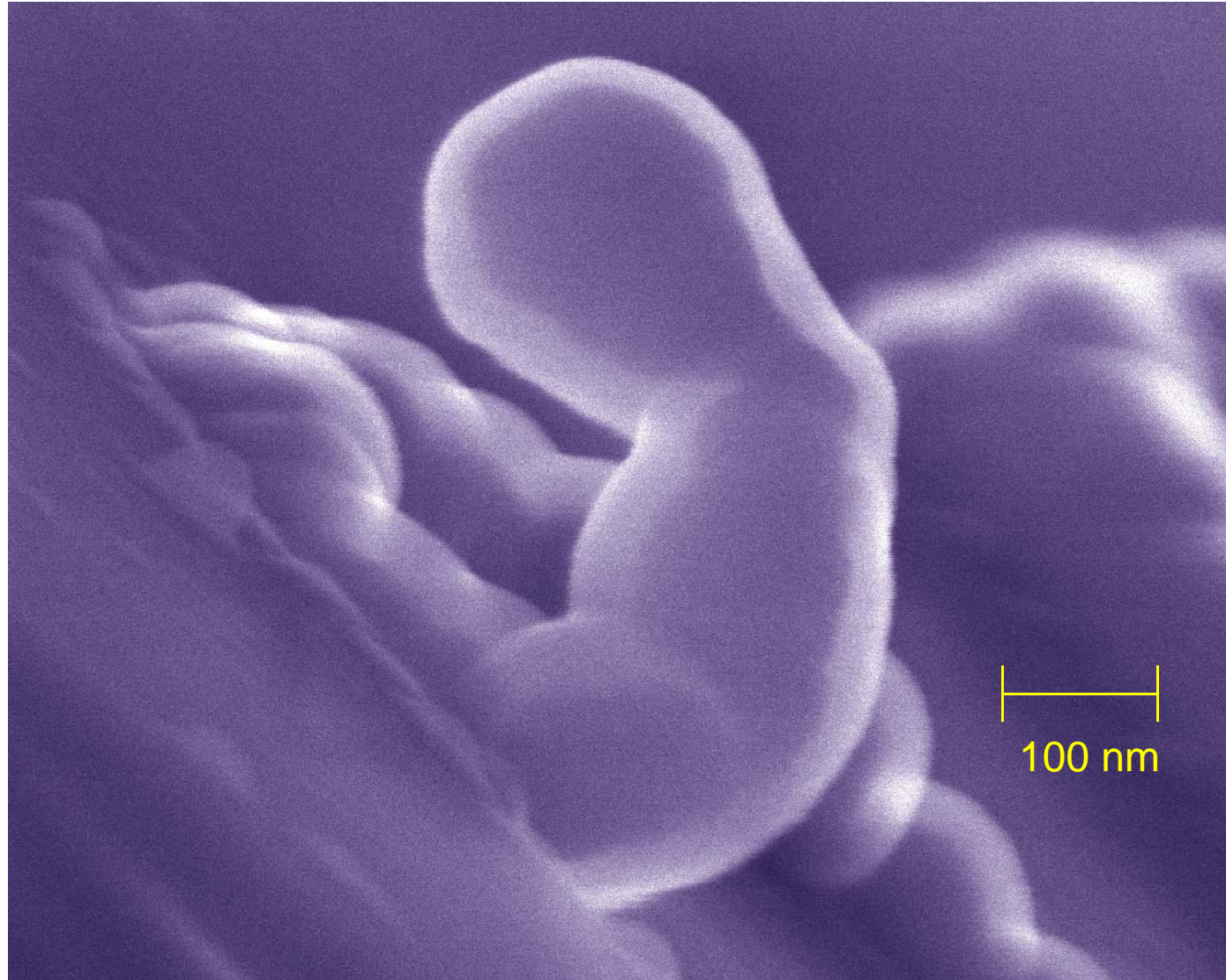


micro & nano - graph
Title:

Nano- Boxer

Description:

Part of a Au nanowire
which was electro-
chemically deposited
on patterned silicon
substrate.



Magnification: 270k

Submitted by: Ran Ji

Instrument: JEOL JSM6340F

Affiliation: Max Planck Institute (MPI) of microstructure physics
Halle, Germany

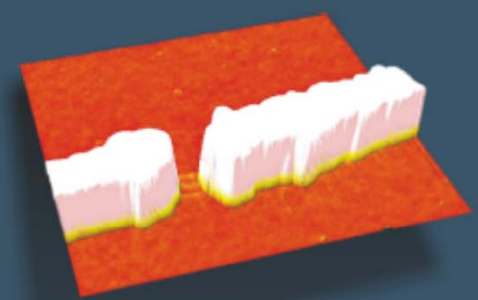
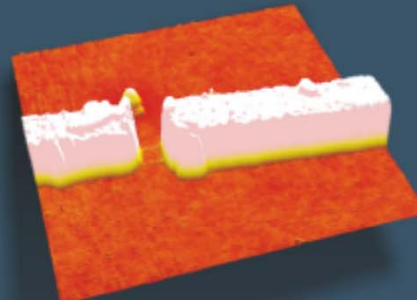
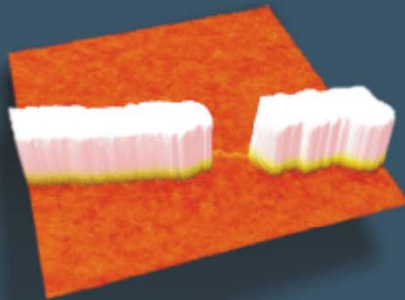
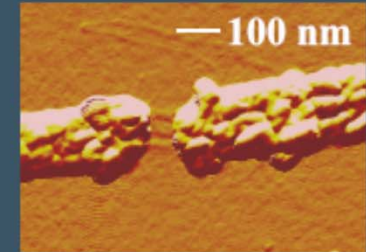
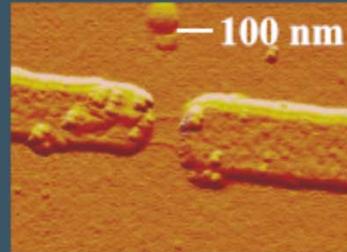
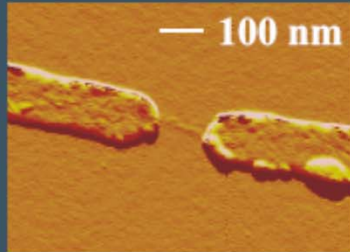


micro & nano - graph
Title:

DNA canyon

Description:

One, two and three
DNA molecules
attached to gold
electrodes.



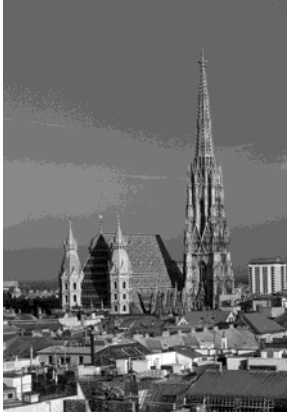
Magnification: Scale on the picture

Submitted by: Anton Kuzyk

Instrument: Veeco Dimension 3100 atomic force microscope

Affiliation: Nanoscience Center, University of Jyväskylä,
Finland

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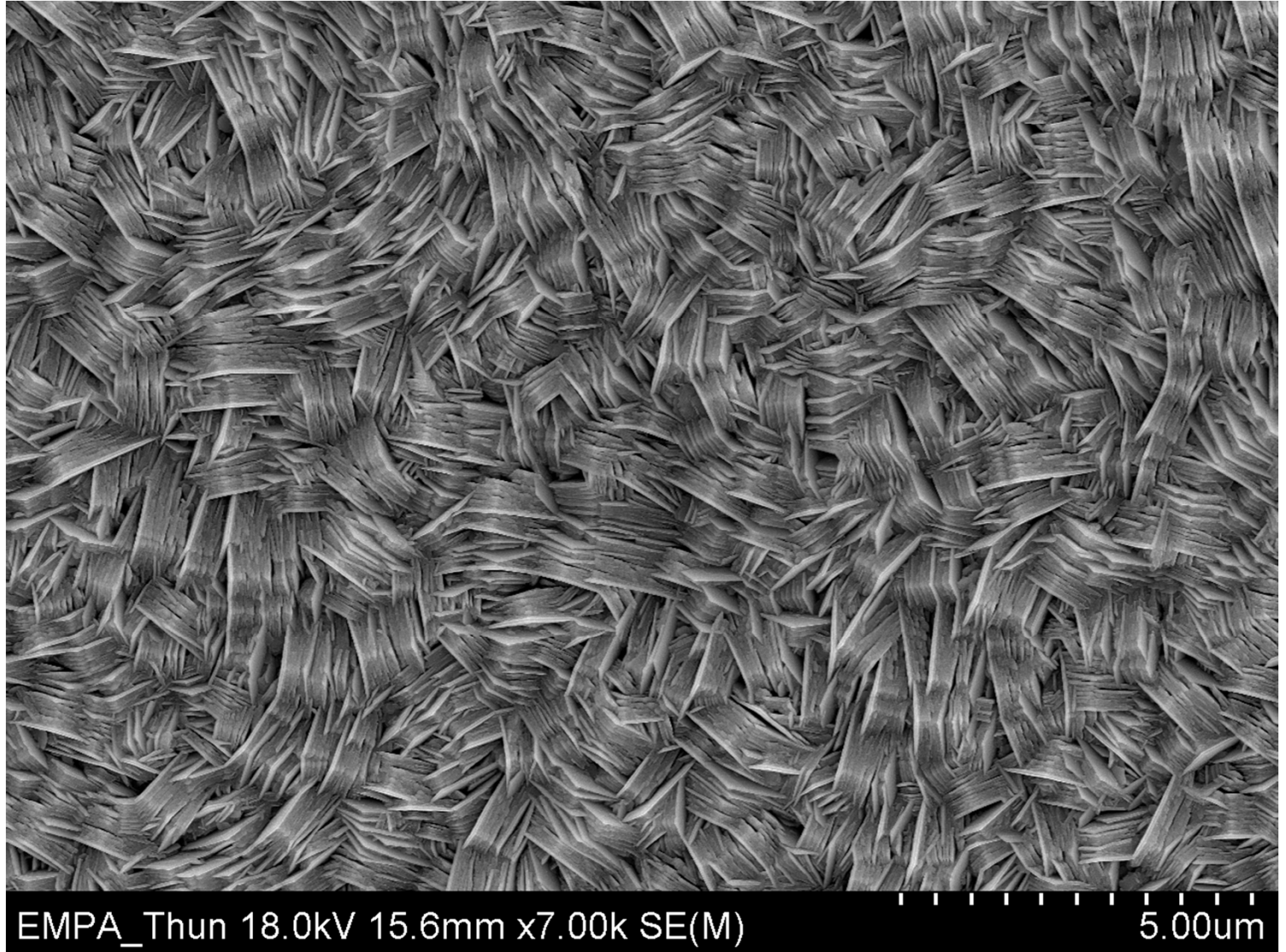


micro & nano - graph
Title:

Chaos in Nano - Library

Description:

CVD grown cobalt
sheets



EMPA_Thun 18.0kV 15.6mm x7.00k SE(M)

5.00um

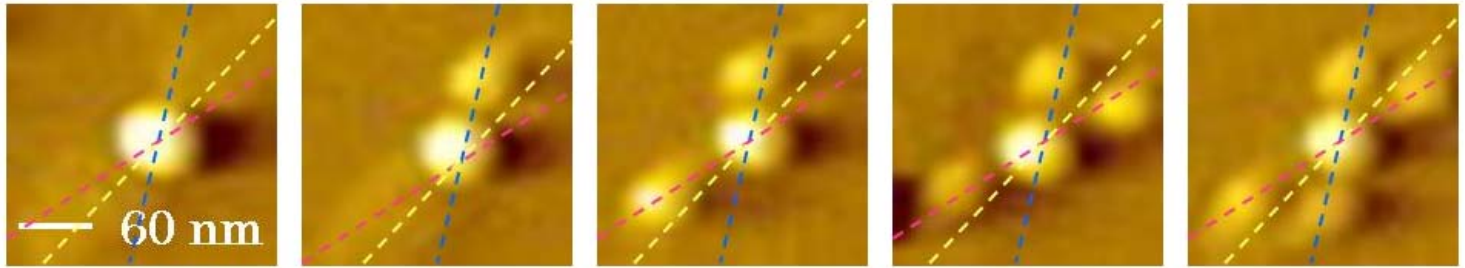
Magnification: **Scale on the picture**

Instrument: **Hitachi S-4800 SEM**

Submitted by: **Vinzenz Friedli**

Affiliation: **EMPA – Materials Science and Technology, Thun
Switzerland**

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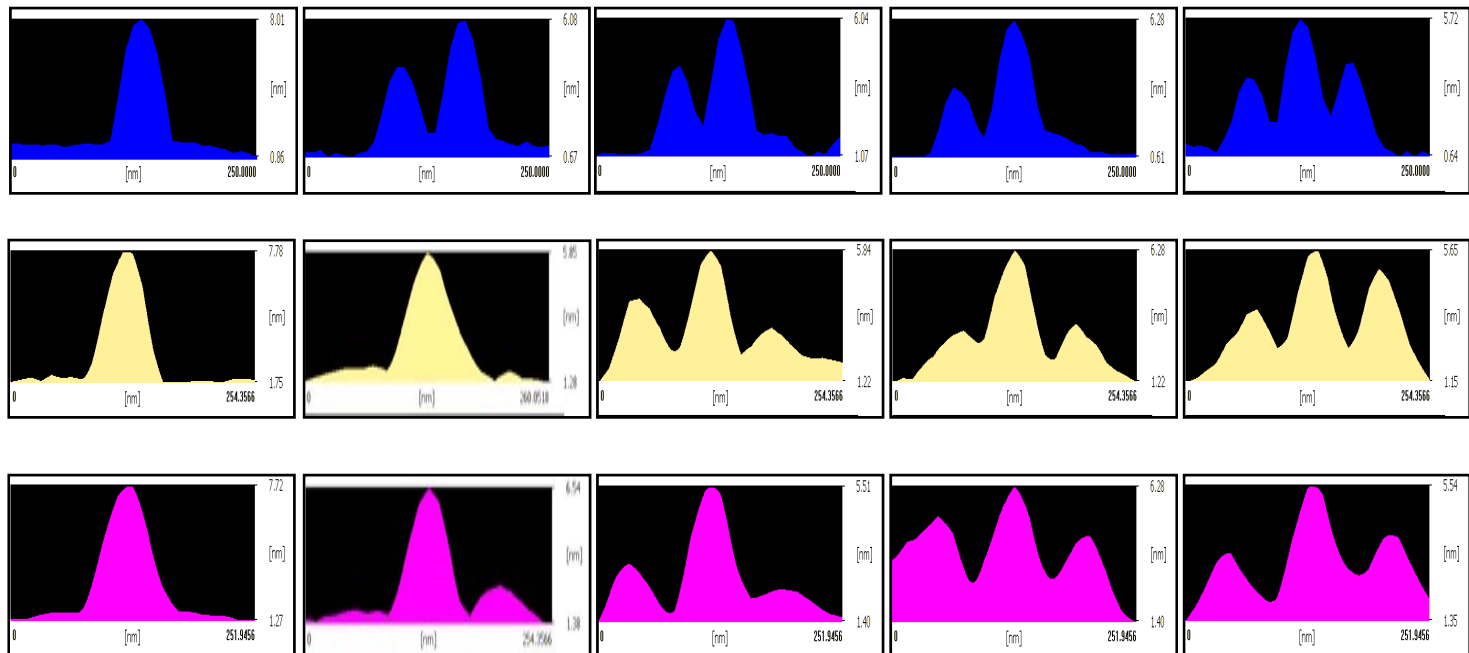


micro & nano - graph
Title:

Quantum Dot Molecules

Description:

Evolution of self-assembled Quantum Dot Molecules (QDM) having 4 satellite dots and their cross sections along [110] and left/right diagonal directions.



Magnification: Scale on the pictures

Submitted by: Somsak Panyakeow

Instrument: Seiko SPA 400-AFM

Affiliation: Chulalongkorn University, Bangkok
Thailand

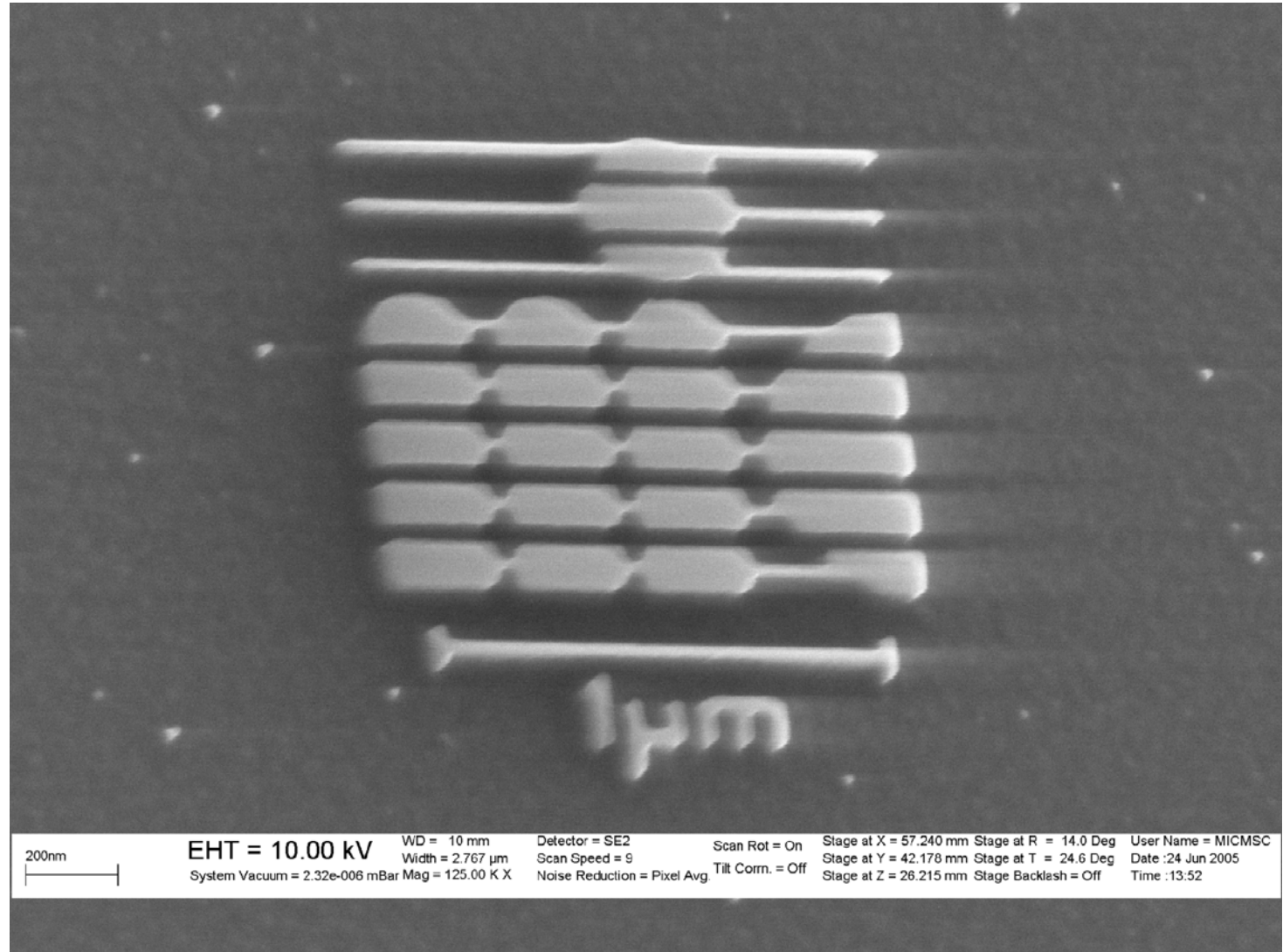


micro & nano - graph
Title:

15nm MIC Logo

Description:

Our MIC logo written with EBL and etched ~60nm into a silicon substrate. The narrowest lines have a width of ~15nm.



Magnification: Scale on the picture

Instrument: LEO SEM, tilted 24.5 deg

Submitted by: Brian Bildenberg Olsen

Affiliation: MIC – Department of Micro and Nanotechnology
Denmark



micro & nano - graph
Title:

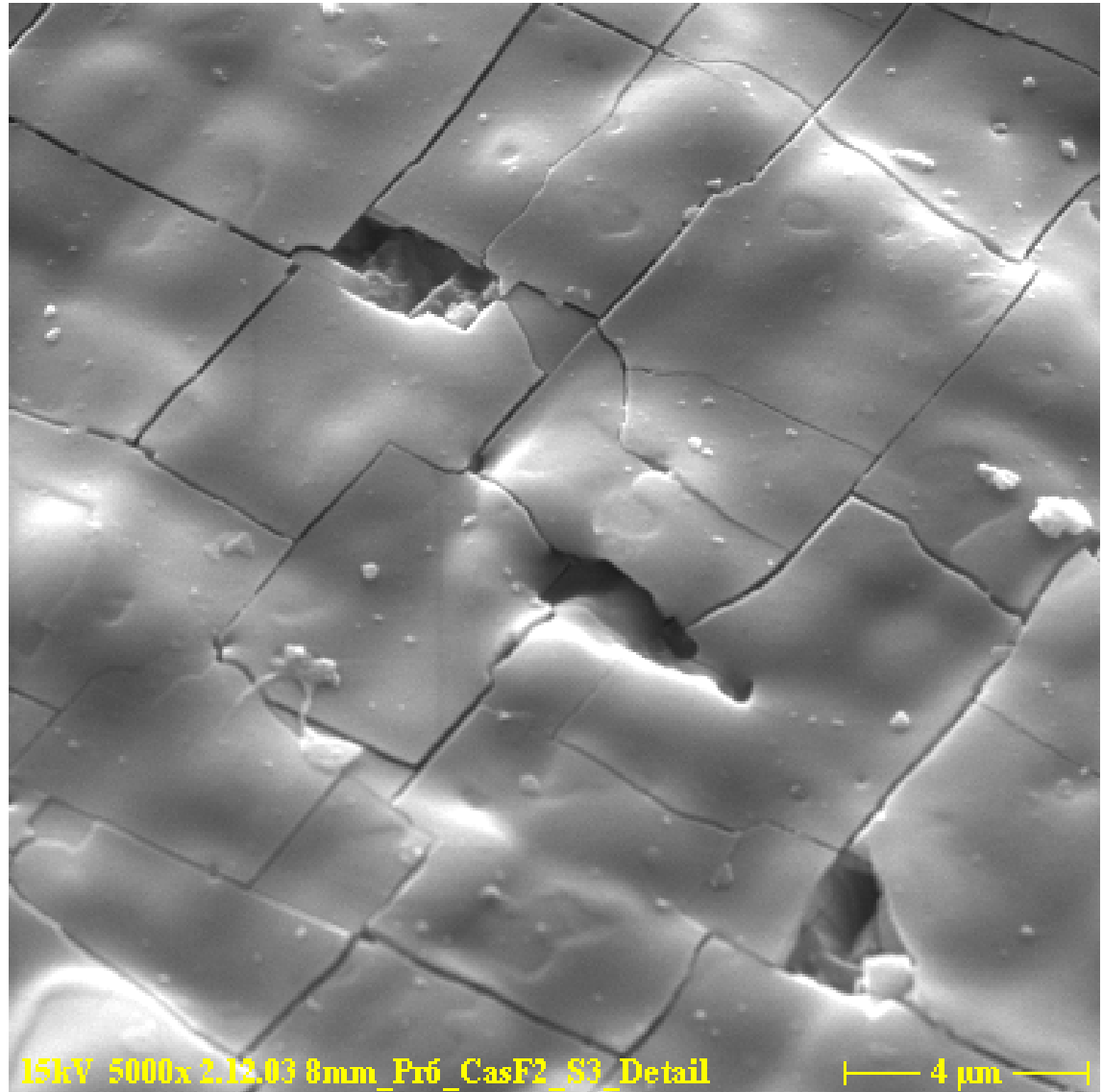
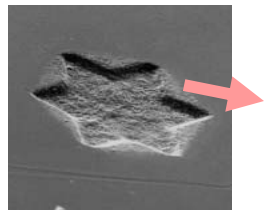
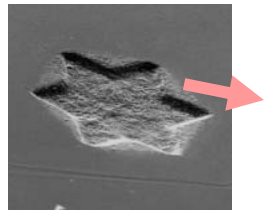
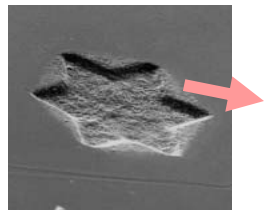
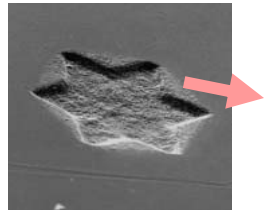
CaF₂ Star

Description:

Laser Processed CaF₂
Surface.

Micro tiles breaking off.

brittle vs. ductile

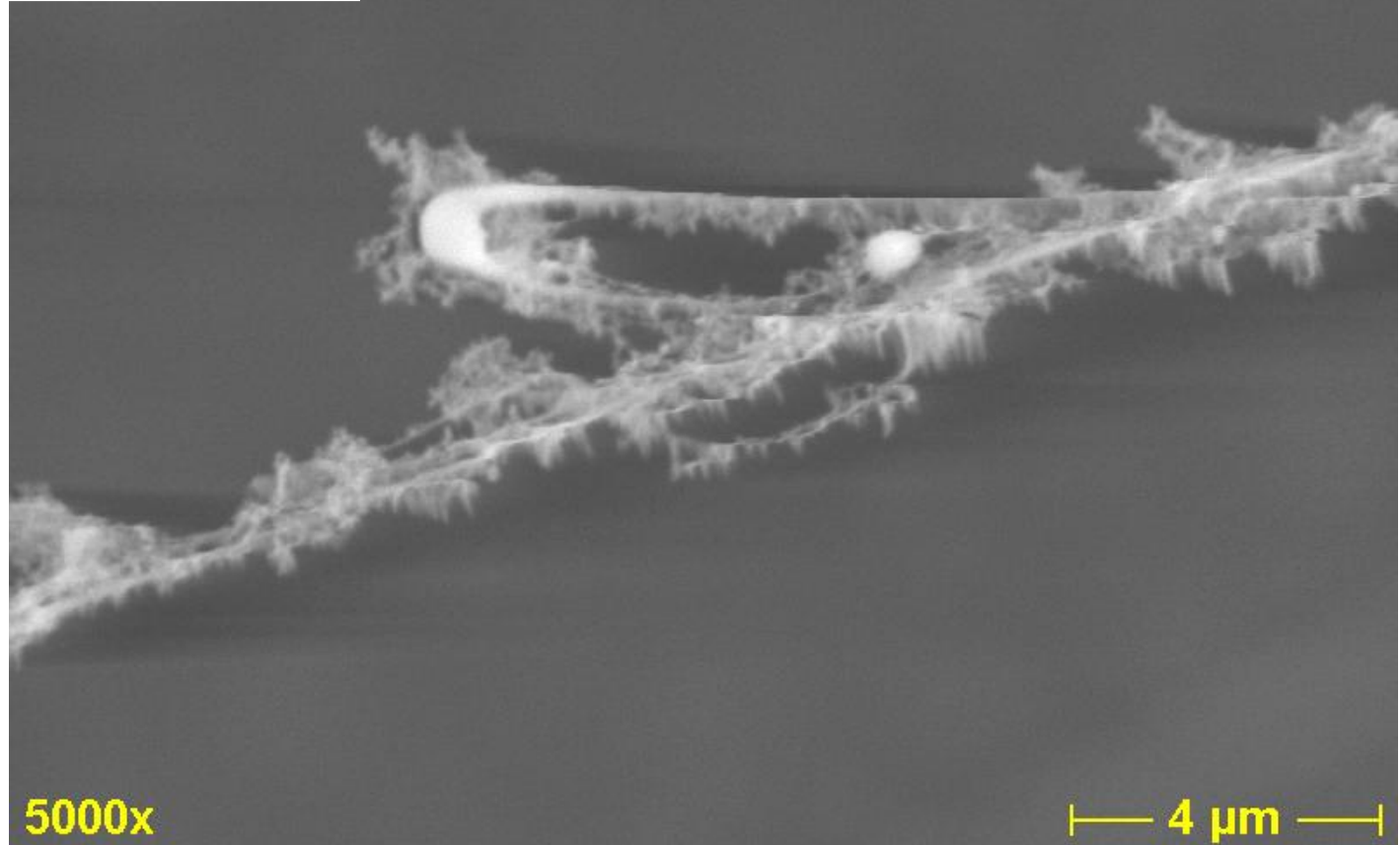
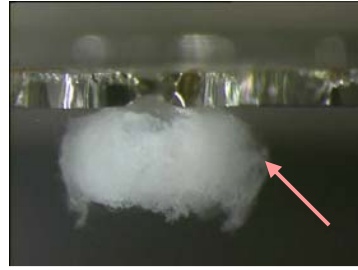


Magnification: **Scale on the picture**

Submitted by: **David Ashkenasi and
Manuela Schwagmeier**

Instrument: **Zeiss DSM 950**

Affiliation: **Laser- und Medizin-Technologie GmbH, Berlin
Germany**



micro & nano - graph
Title:

Borosilicate Fiber AF45

Description:

Fibers extracted from a
Tangle inside Glass
Wool after Laser Drilling
into Thin Borosilicate
Glass.

Magnification: **Scale on the picture**

Instrument: **Zeiss DSM 950**

Submitted by: **David Ashkenasi and
Manuela Schwagmeier**

Affiliation: **Laser- und Medizin-Technologie GmbH, Berlin
Germany**

MINE 2005 micro & nano - graph Contest

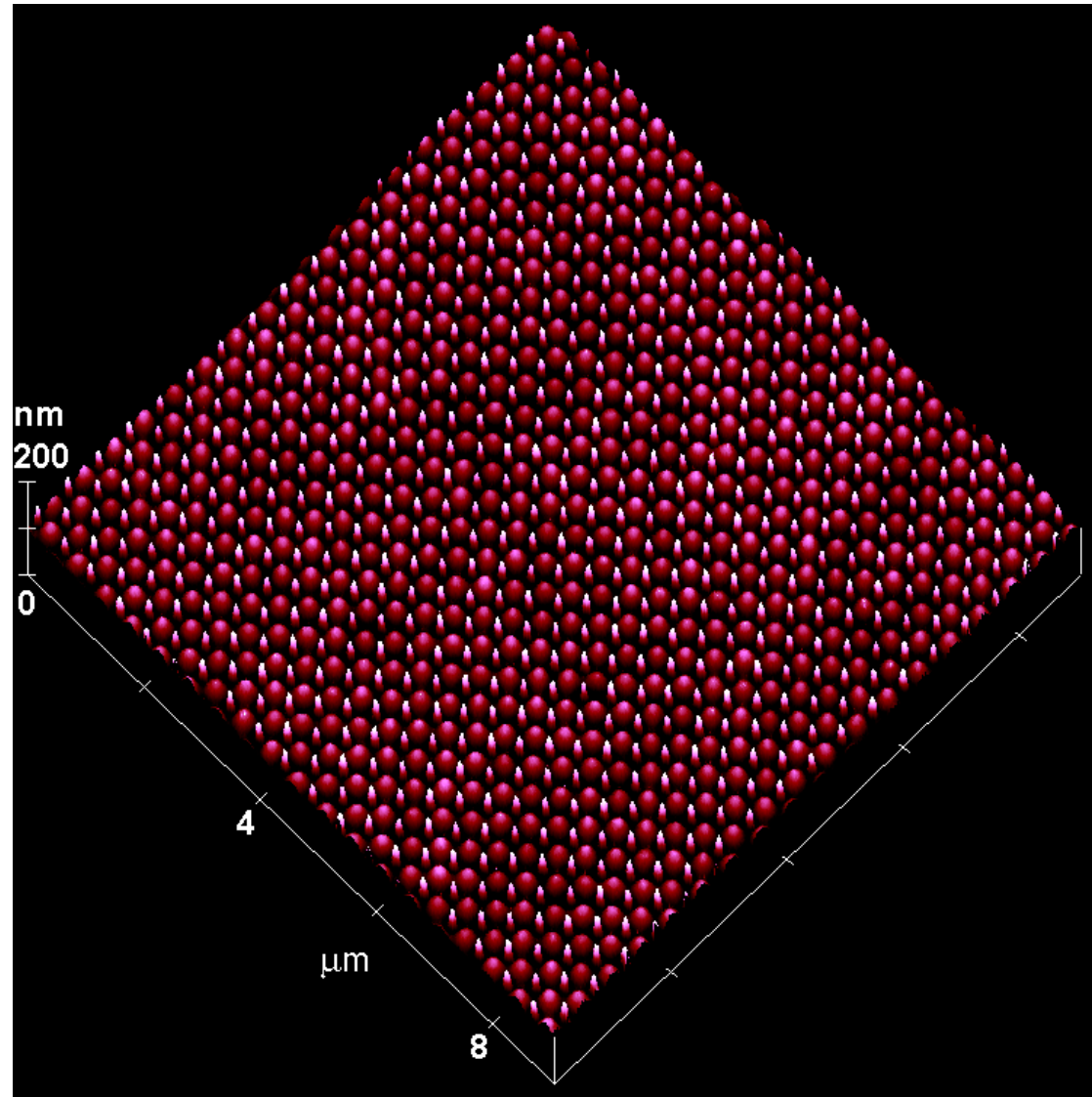


micro & nano - graph
Title:

Ordered GeSi Dots

Description:

AFM image of perfect ordered GeSi islands grown by MBE on a pre-patterned Si (001) substrate.



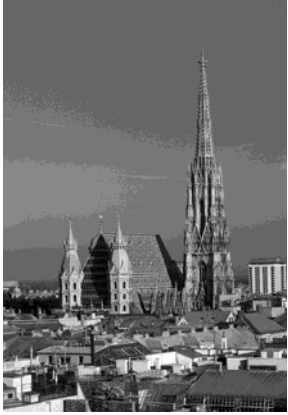
Magnification: **Scale on the picture**

Submitted by: **Zhenyang Zhong**

Instrument: **Veeco Dimension 3100 Atomic Force Microscope**

Affiliation: **Johannes Kepler University of Linz
Austria**

MINE 2005 micro & nano - graph Contest

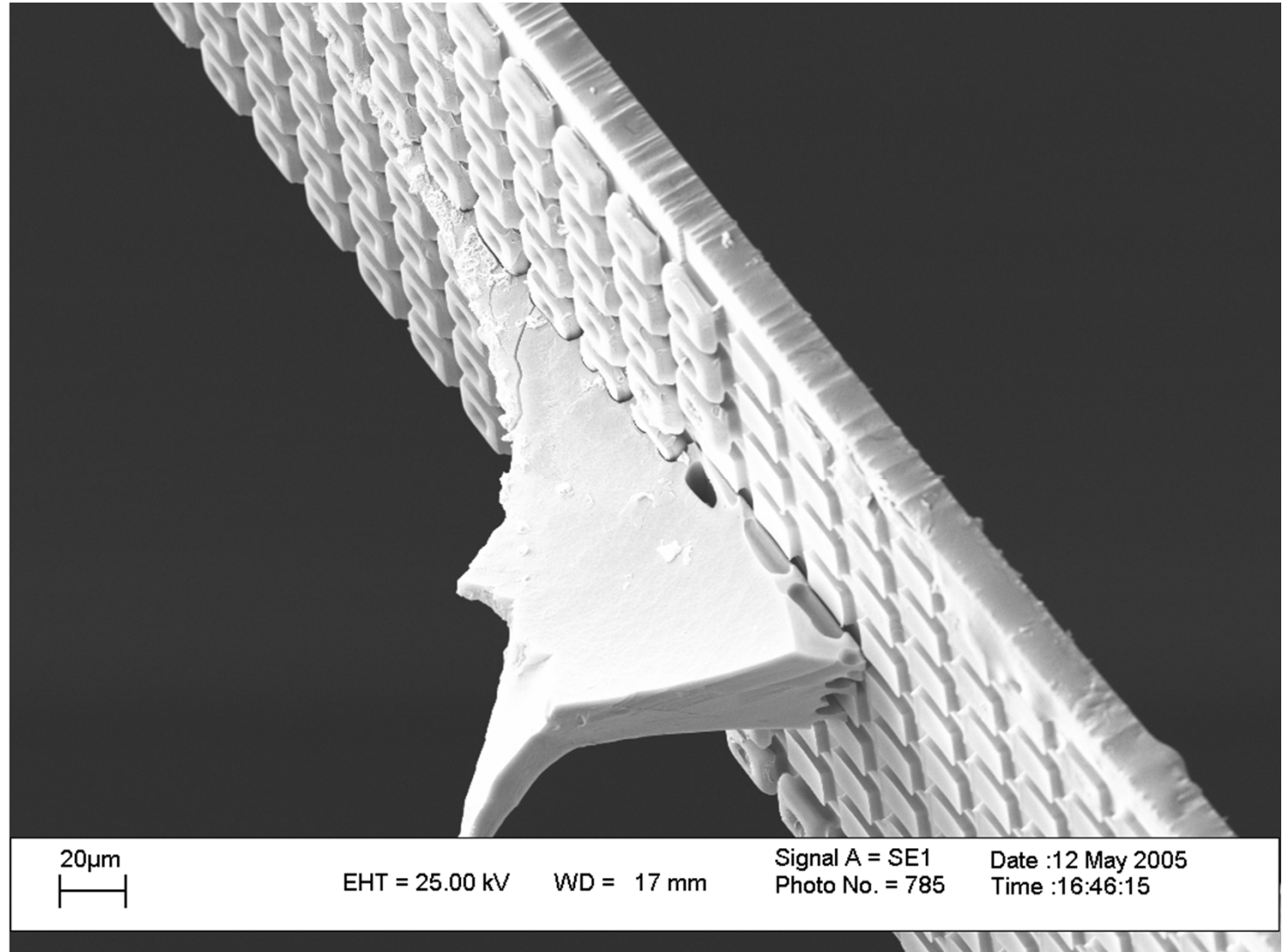


micro & nano - graph
Title:

Cliffhanger

Description:

A piece of Si remains attached to the underside of a strip of SU-8 following a controlled peel test from a Si substrate. Adhesion between the two materials is enhanced by mechanical interlocking between interpenetrating lobes.



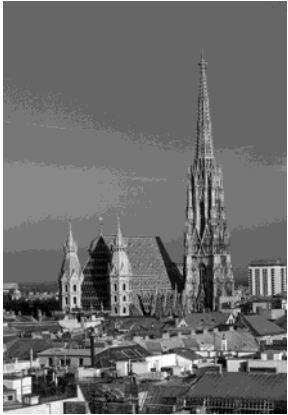
Magnification: Scale on the picture

Submitted by: Michael Larsson

Instrument: LEO 1450 VP

Affiliation: Optical & SC Dev. Group, Imperial College London
UK

MNE 2005 micro & nano - graph Contest

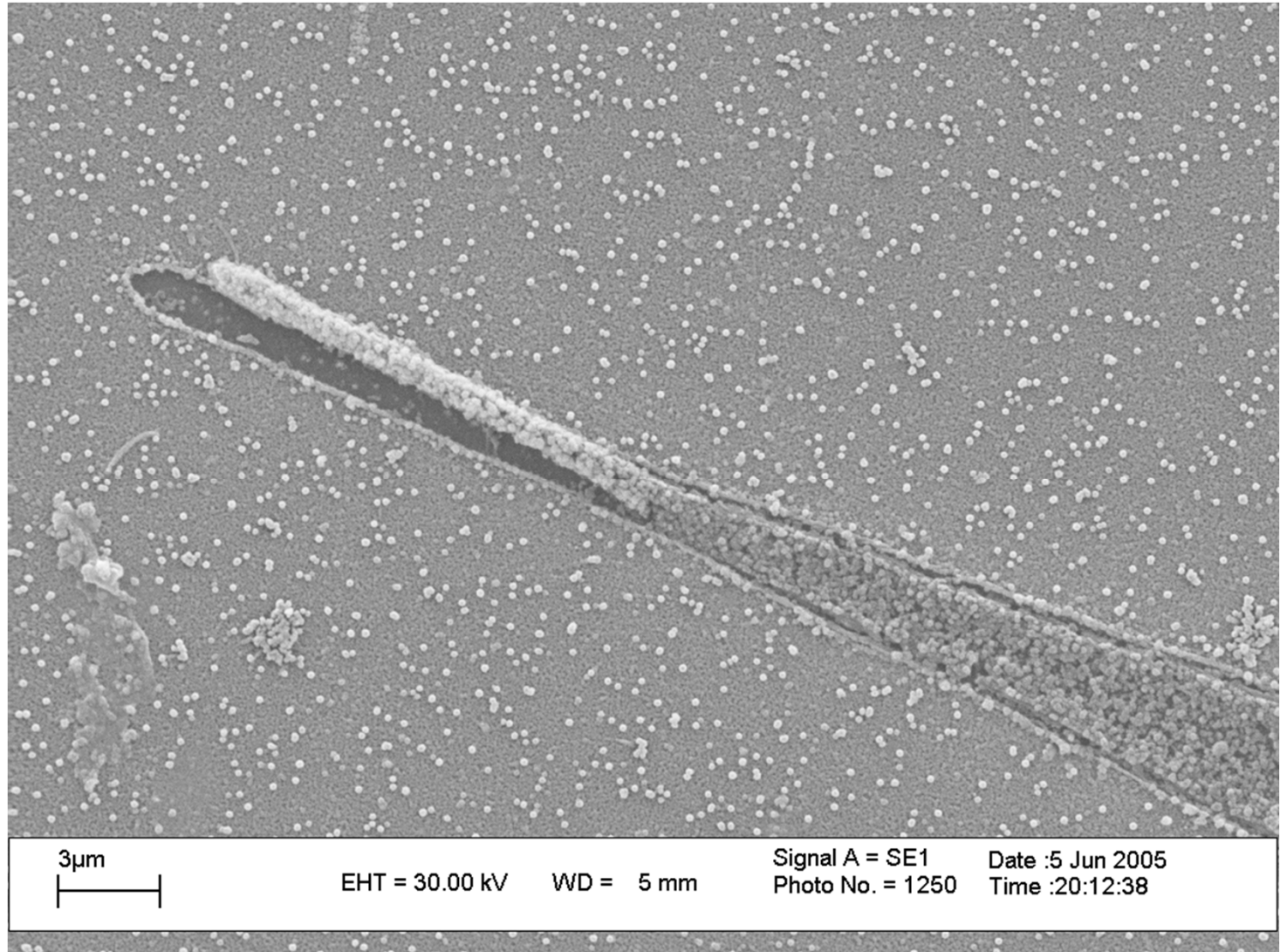


micro & nano - graph
Title:

C_{60} "ness"

Description:

C_{60} clusters electro-phoretically deposited on Si through an opening in a sputtered SiO_2 mask. The tip of the structure has peeled from the substrate following removal from solution.

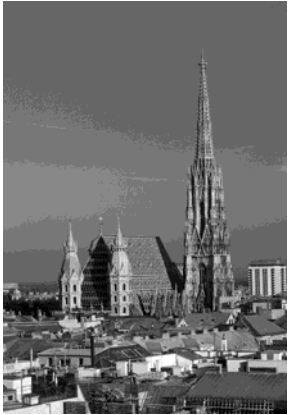


Magnification: Scale on the picture

Submitted by: Michael Larsson

Instrument: LEO 1450 VP

Affiliation: Optical & SC Dev. Group, Imperial College London
UK

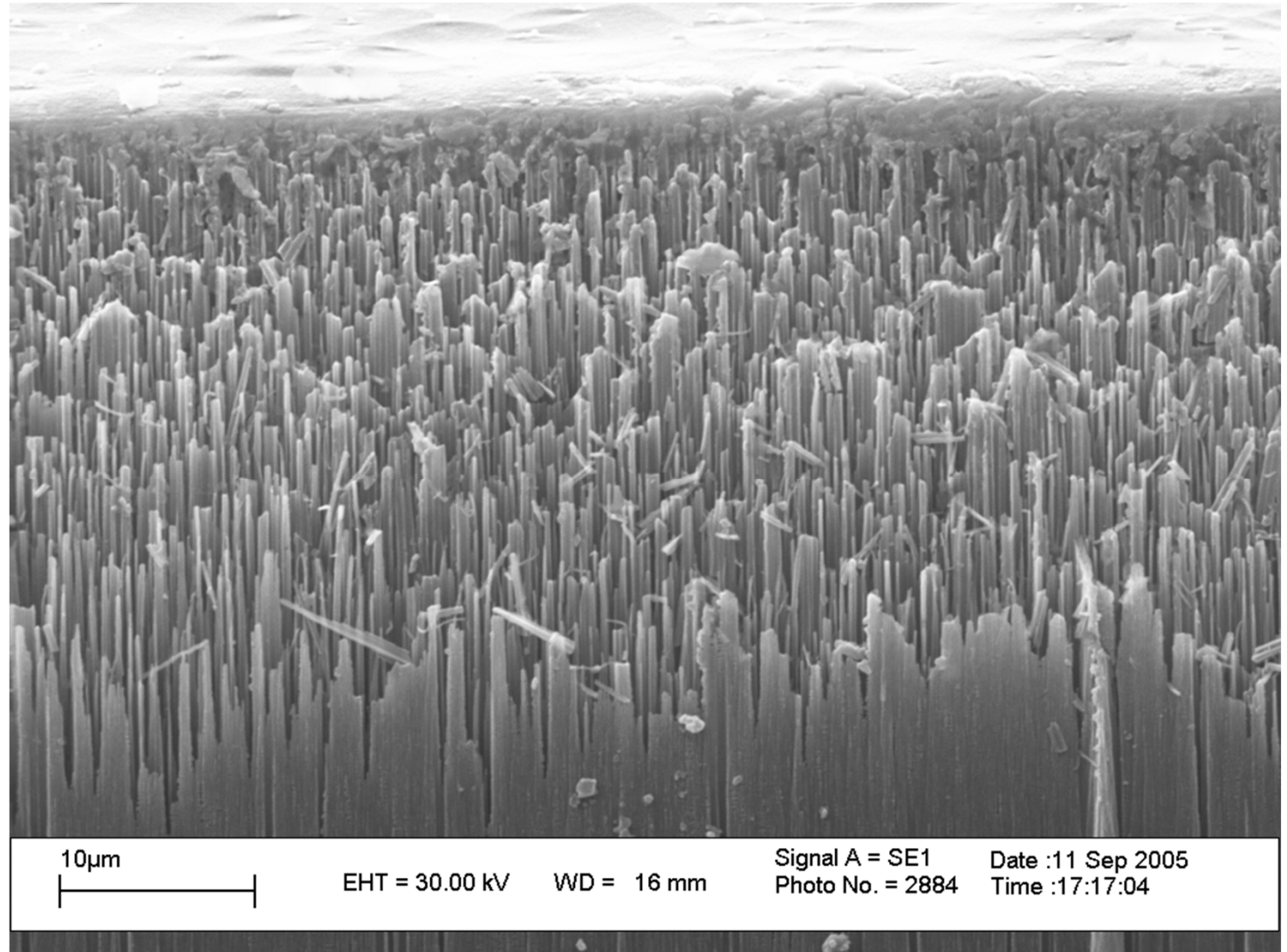


micro & nano - graph
Title:

Spires

Description:

Sidewall damage following through-thickness deep reactive ion etching of a 4" Si wafer



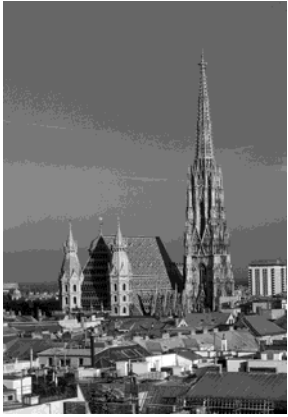
Magnification: **Scale on the picture**

Submitted by: **Michael Larsson**

Instrument: **LEO 1450 VP**

Affiliation: **Optical & SC Dev. Group, Imperial College London
UK**

MINE 2005 micro & nano - graph Contest



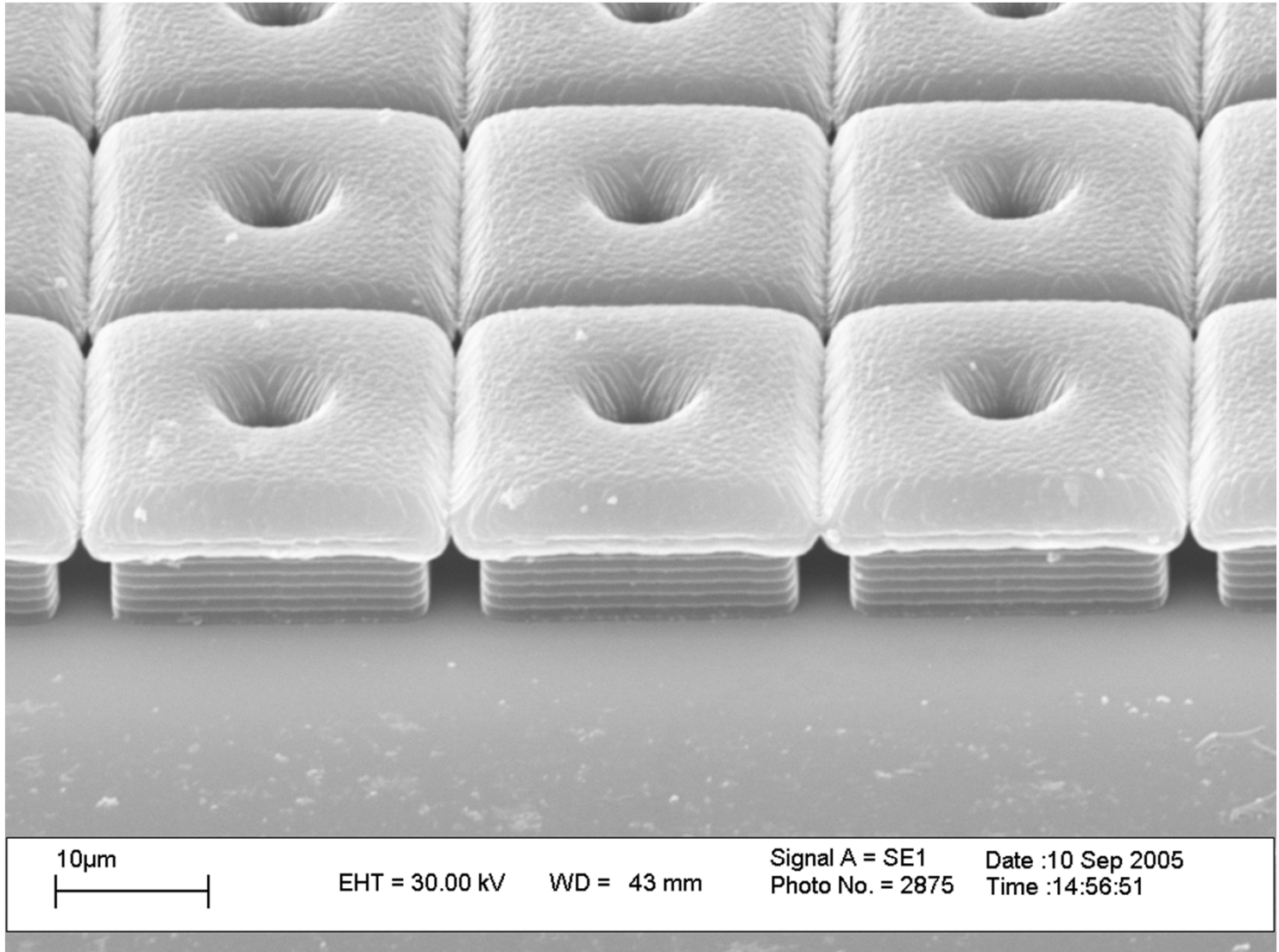
micro & nano - graph
Title:

Muffins

Description:

3D features formed in SU-8 via complete filling of overhanging plasma-etched mould inserts in a Si substrate.

Release is achieved via complete etching of the Si substrate.



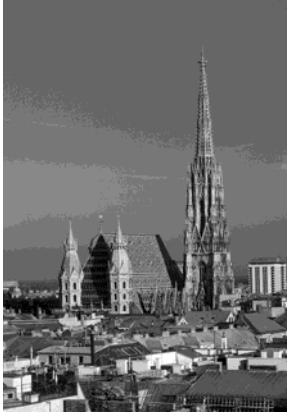
Magnification: Scale on the picture

Submitted by: Michael Larsson

Instrument: LEO 1450 VP

Affiliation: Optical & SC Dev. Group, Imperial College London
UK

MINE 2005 micro & nano - graph Contest

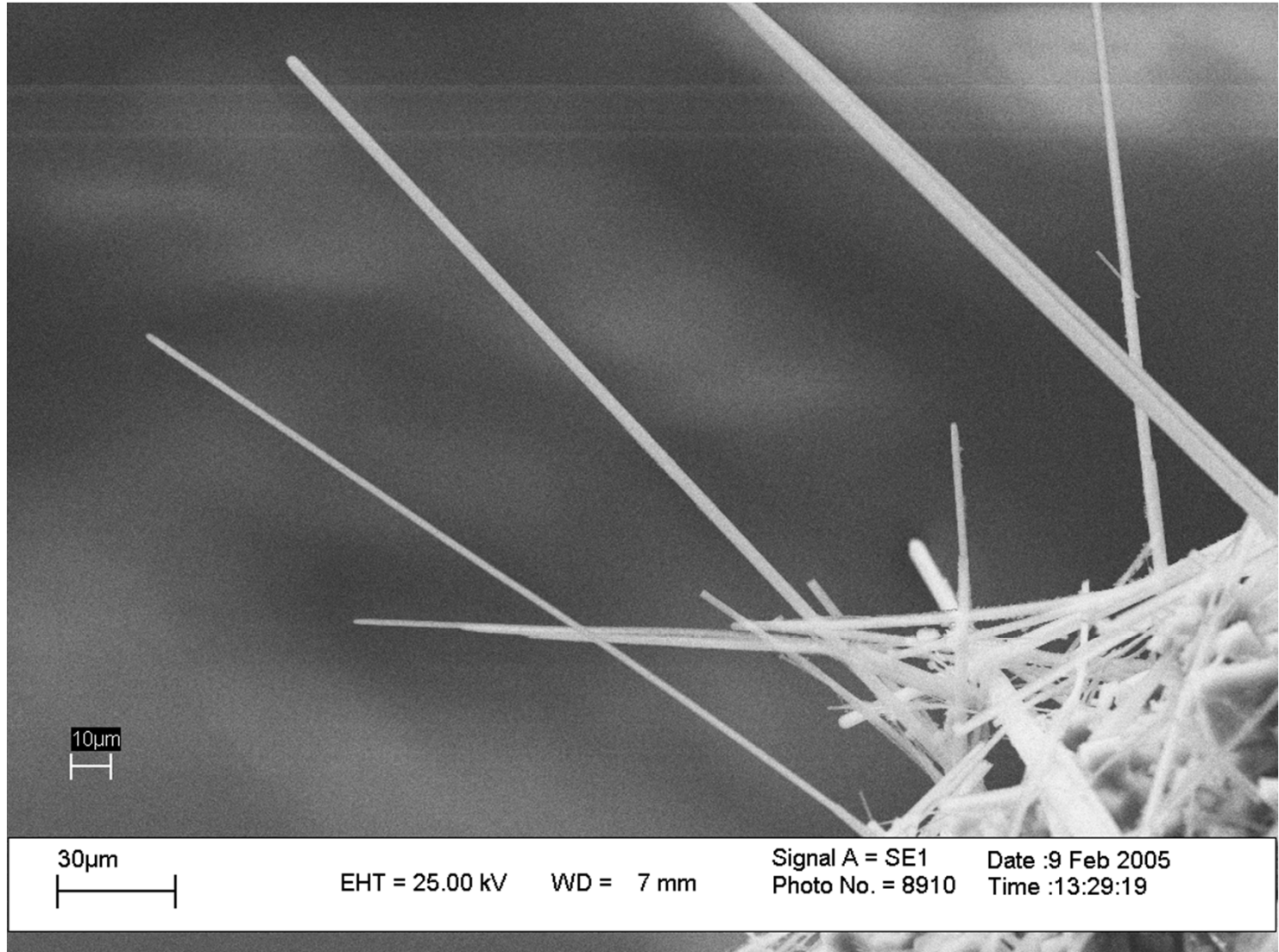


micro & nano - graph
Title:

Thorns

Description:

Needles formed in C60 through polymerisation between adjacent molecules at the liquid-liquid interface between a mixture of C60 toluene solution and Propan-2-ol.



Magnification: Scale on the picture

Submitted by: Michael Larsson

Instrument: LEO 1450 VP

Affiliation: Optical & SC Dev. Group, Imperial College London
UK

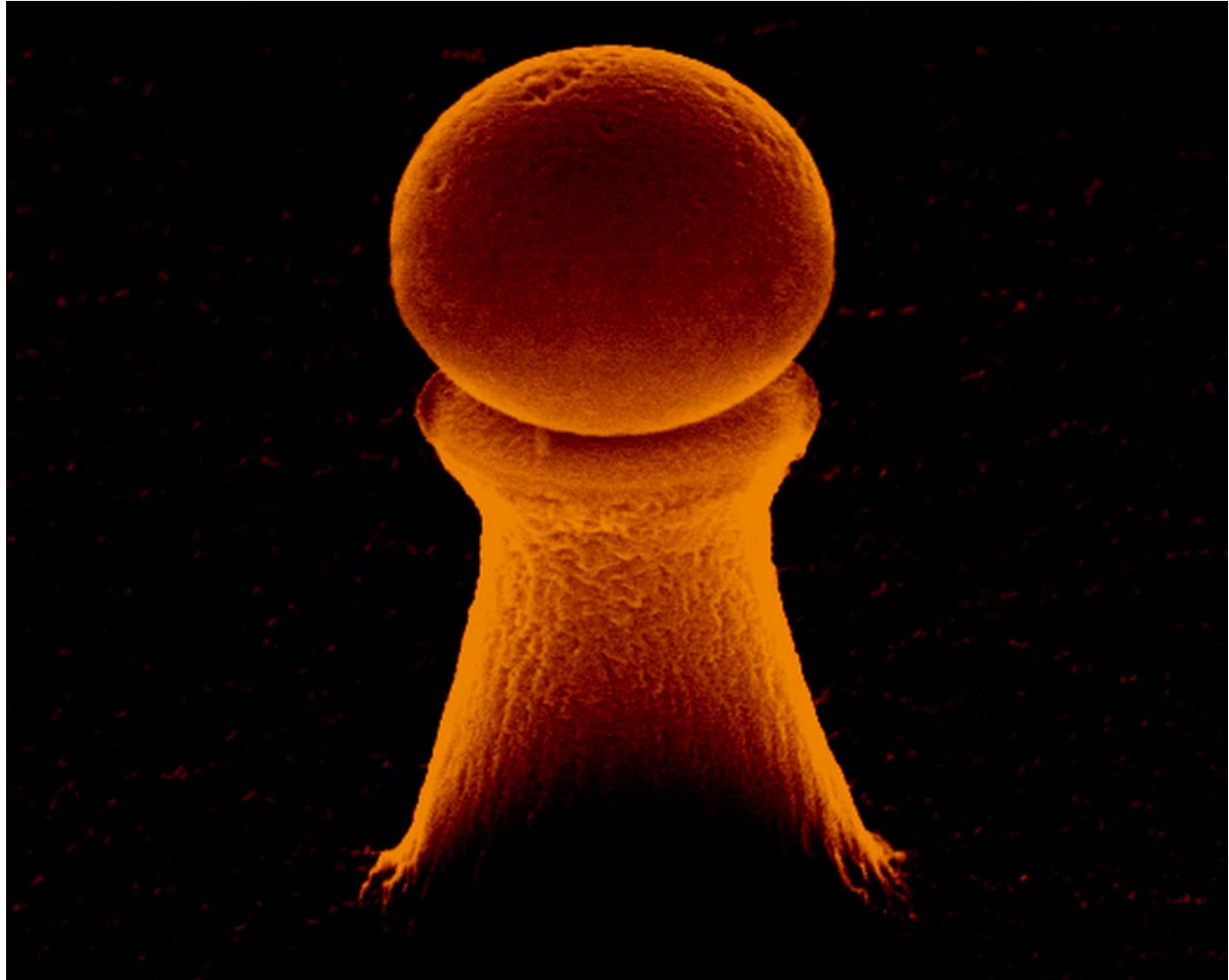


micro & nano - graph
Title:

smallest golfball of the world

Description:

SiO₂ on a Si-wafer.
During dry-etch of the Si
complete resist under
etch.



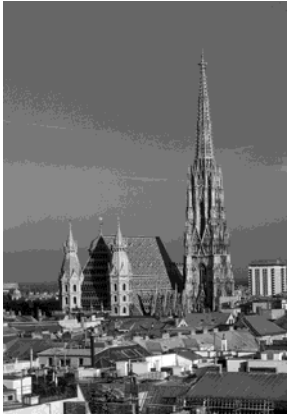
Magnification: **38.204x**

Submitted by: **Frans Holthuysen**

Instrument: **PHILIPS XL40 FEG**

Affiliation: **Philips Research, Eindhoven
Netherlands**

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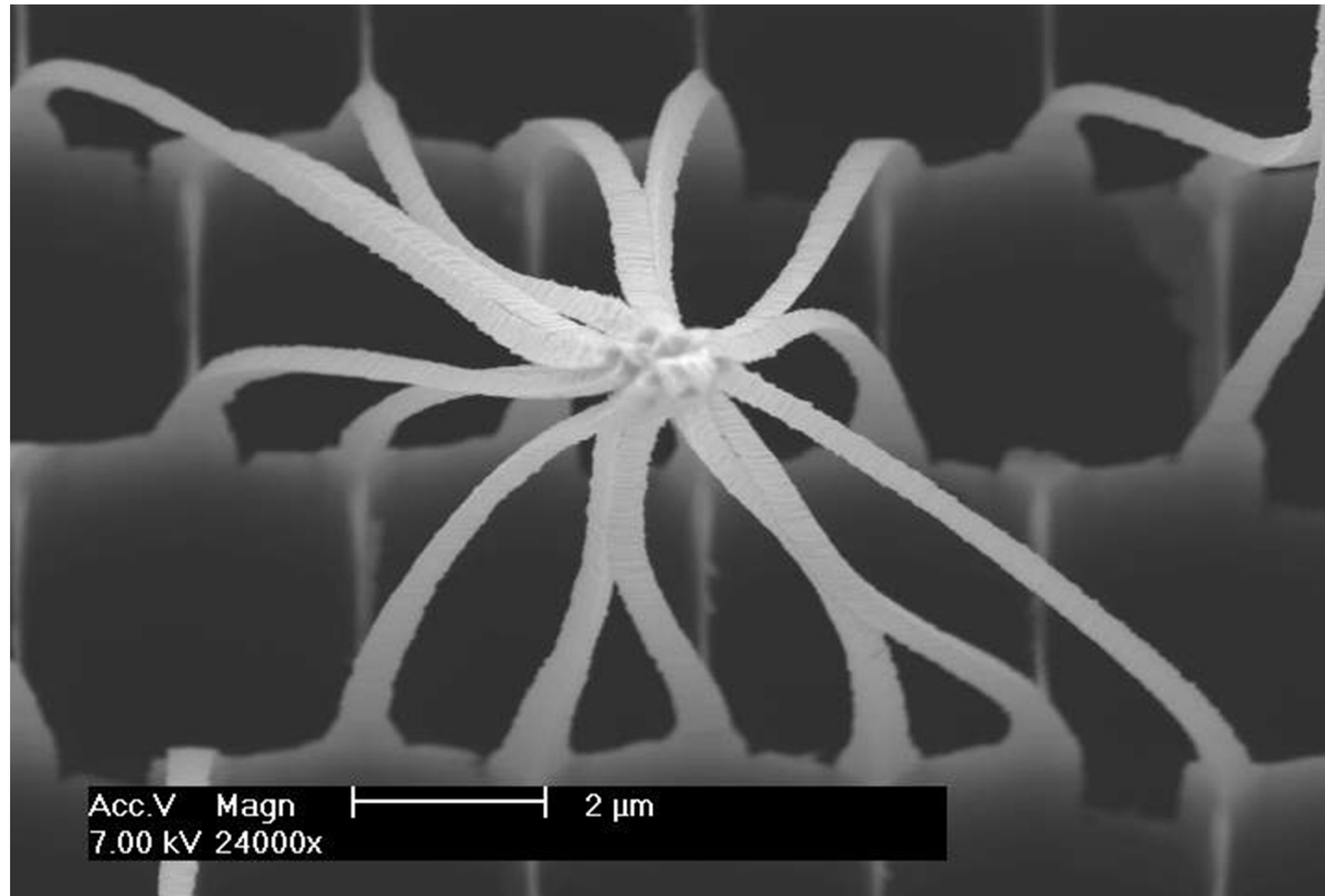


micro & nano - graph
Title:

Nano-Spider

Description:

Etching a silicon wafer in several steps forms freestanding single-crystalline silicon whiskers with a length of 100 micrometer and a diameter of 300 nanometer. Due to capillary forces and van der Waals interactions the wires are clustered.



Magnification: Scale on the picture

Submitted by: Frans Holthuysen

Instrument: PHILIPS XL40 FEG

Affiliation: Philips Research, Eindhoven
Netherlands

MINE 2005 micro & nano - graph Contest

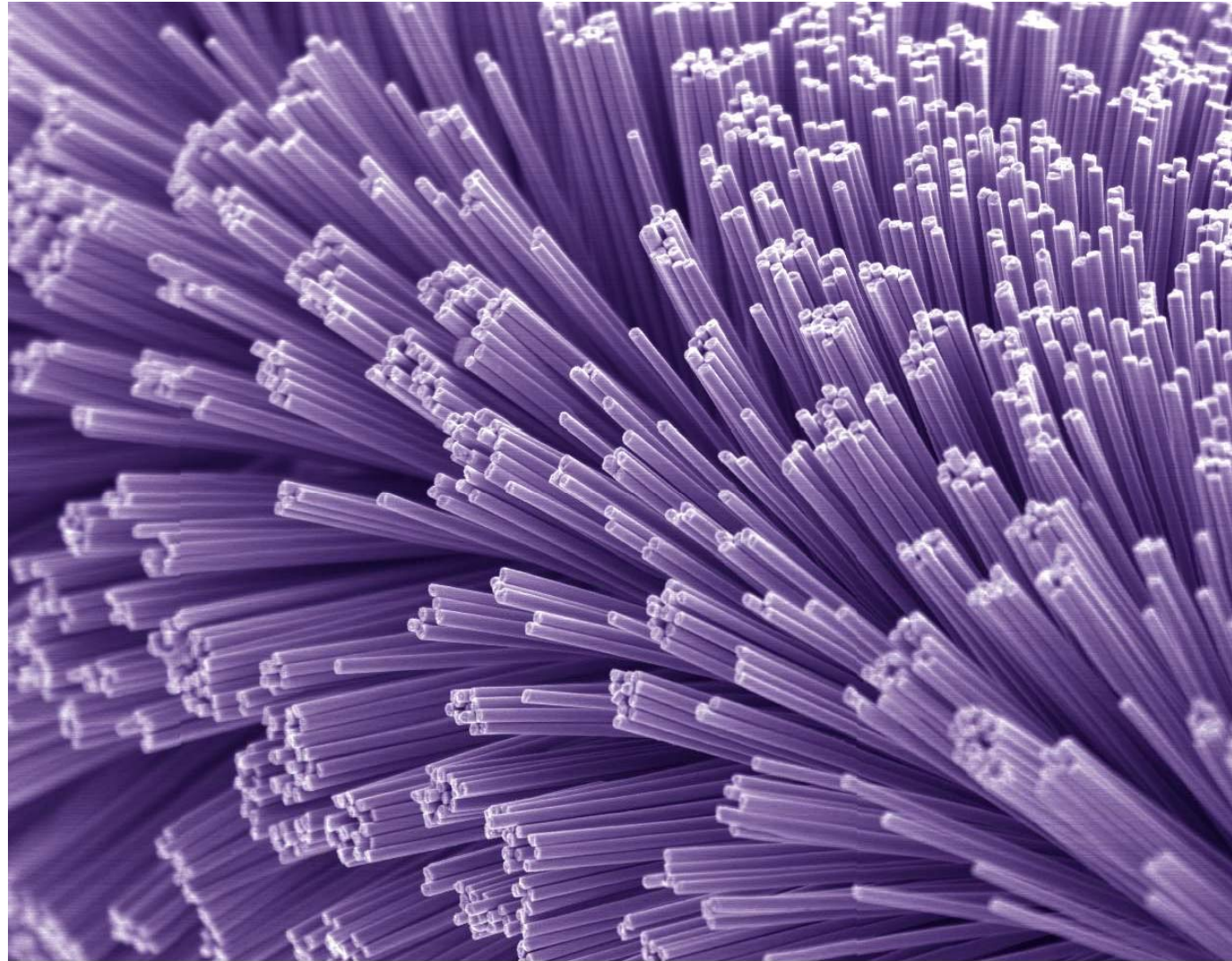


micro & nano - graph
Title:

Micro Brush

Description:

Aligned metal
nanowires.



6 μm

Magnification: Scale on the picture

Submitted by: Woo Lee

Instrument: Jeol JSM6300F

Affiliation: Max-Planck-Institut für Mikrostrukturphysik, Halle,
Germany

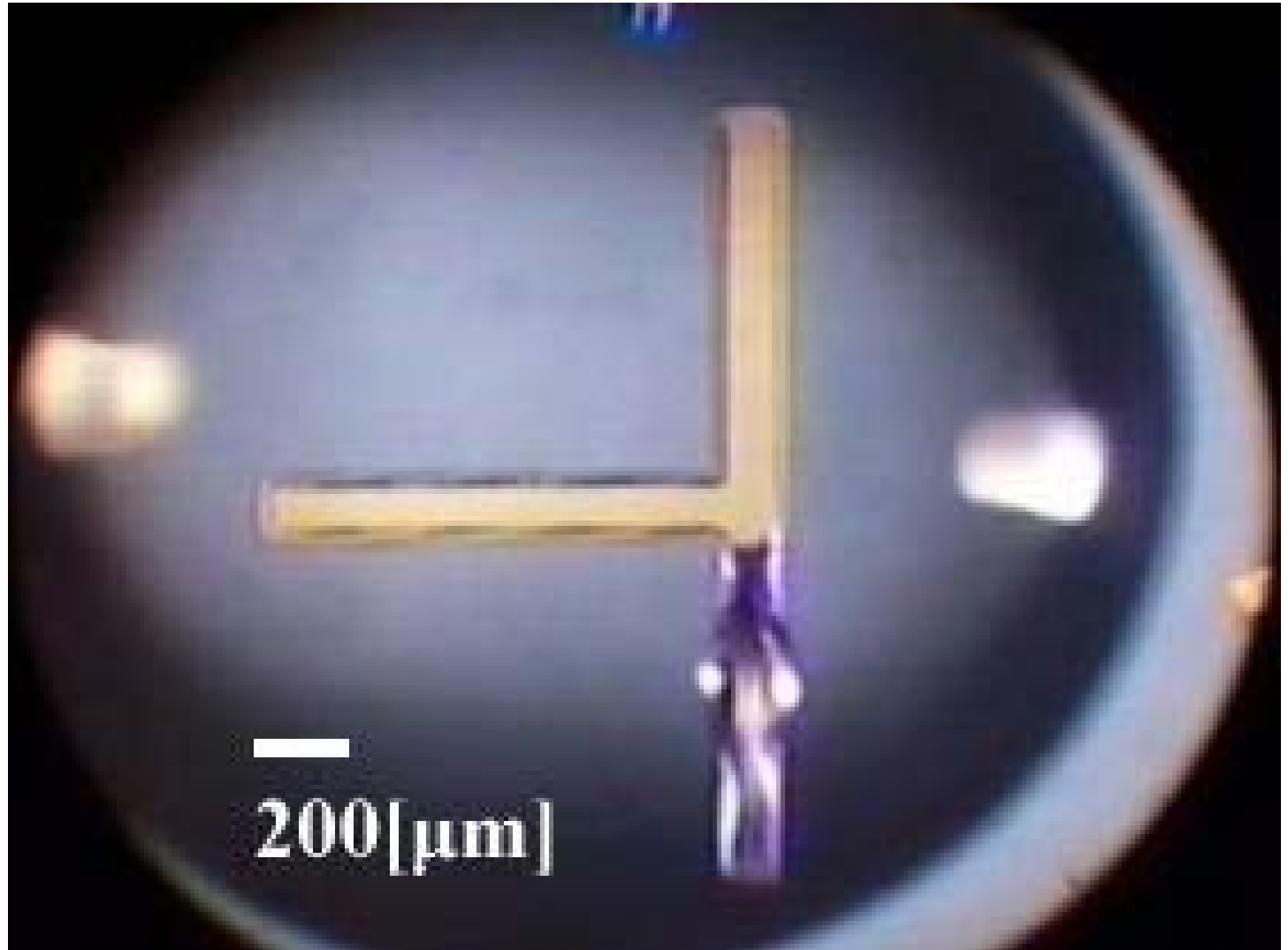


micro & nano - graph
Title:

Lucid Cobra

Description:

A deformed micro bubble trapped at concave line pattern can be observed after dipping into DI water. Micro bubble moves smoothly in micro concave ditch due to interface energy balance.



Magnification: Scale on the picture

Submitted by: Akira Kawai,
Tomotaka Ariga, Hotaka Endo

Instrument: Nikon 71387 optical microscope

Affiliation: Nagaoka University of Technology
Japan

MINE 2005

micro & nano - graph Contest

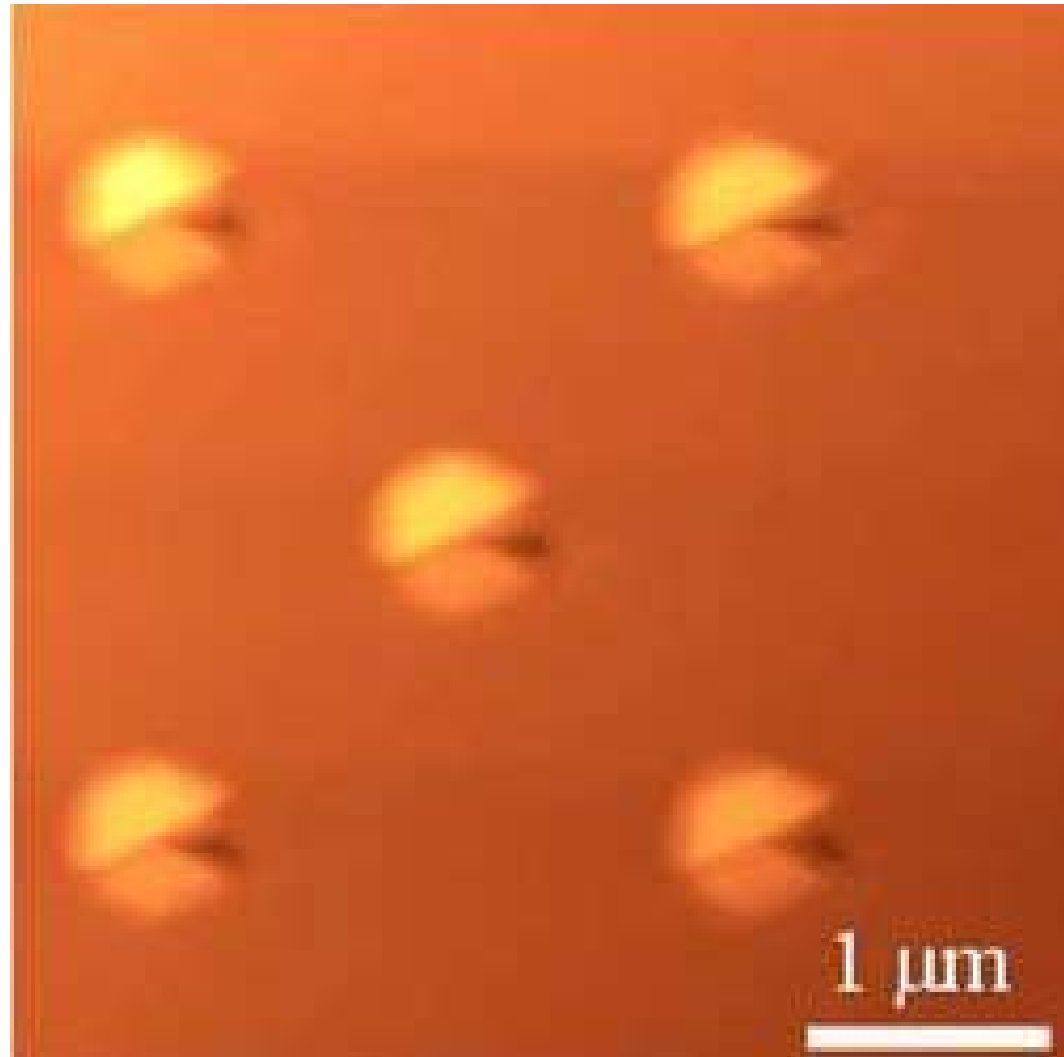


micro & nano - graph
Title:

Micro PAC-MAN

Description:

The micro fragments of ArF excimer resist surface can be confirmed after the tip indentation test. It is clearly observed that the surface hardened layer is formed on the extreme surface region of the resist film.



Magnification: Scale on the picture

Submitted by: Akira Kawai,
Takahiro Moriuchi, Takashi Tanji

Instrument: AFM SPA300 Seiko Instruments

Affiliation: Nagaoka University of Technology
Japan

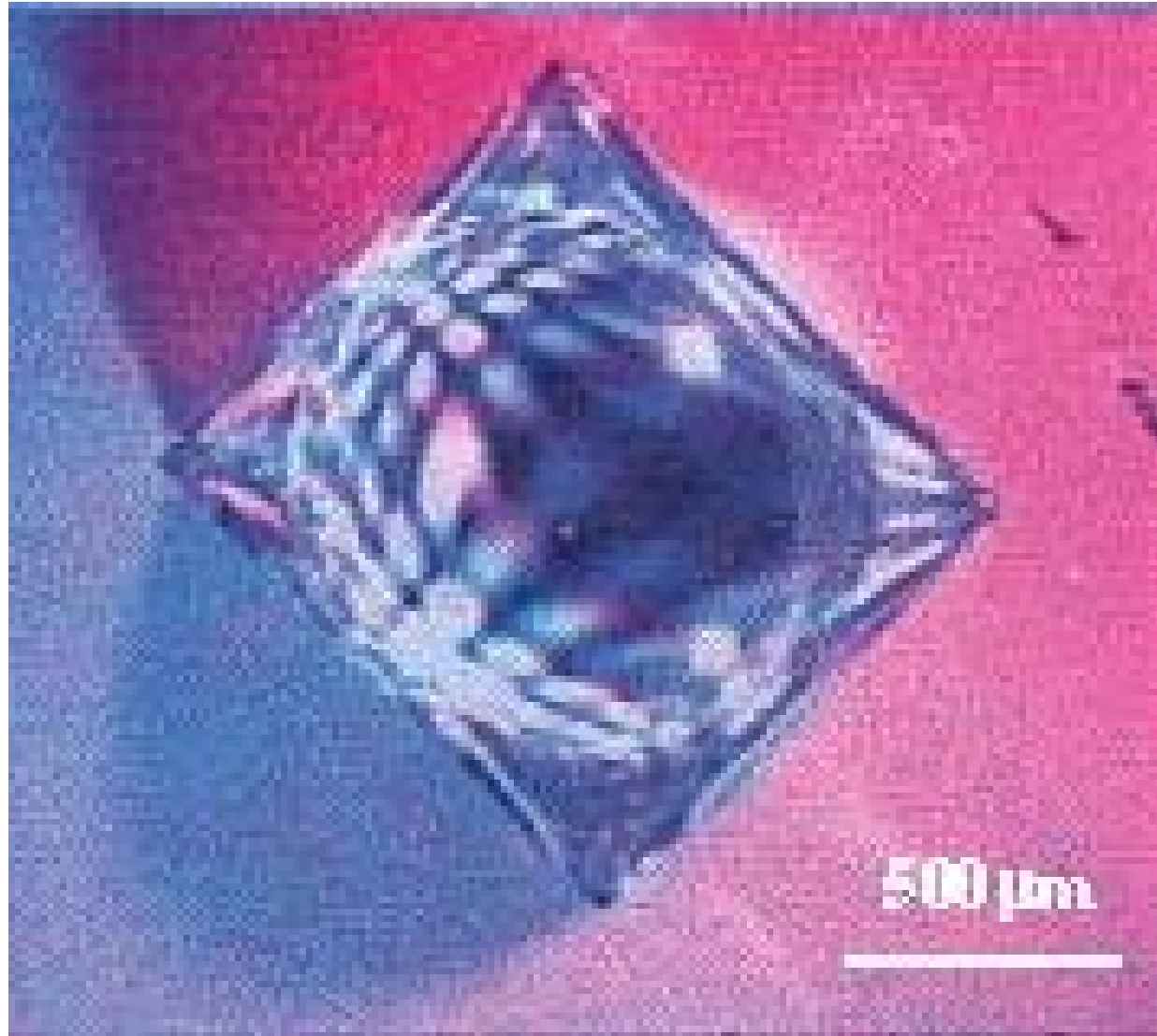


micro & nano - graph
Title:

Jewelry Drop

Description:

A water dropped on a lattice shaped pattern changes its shape into a square, which looks like a luminous square-shaped jewel.



Magnification: Scale on the picture

Submitted by: Takayoshi Niiyama,
Akira Okada, Akira Kawai

Instrument: Leitz MPV optical microscope

Affiliation: Nagaoka University of Technology
Japan

MINE 2005 micro & nano - graph Contest



micro & nano - graph
Title:

Fossil Skeleton of a Micro Dinosaur

Description:

silicon etched by gas
chopping



Magnification: **Scale on the picture**

Instrument: **Hitachi S-4000**

Submitted by: **Burkhard E. Volland**

Affiliation: **University of Kassel,
Germany**

MINE 2005 micro & nano - graph Contest

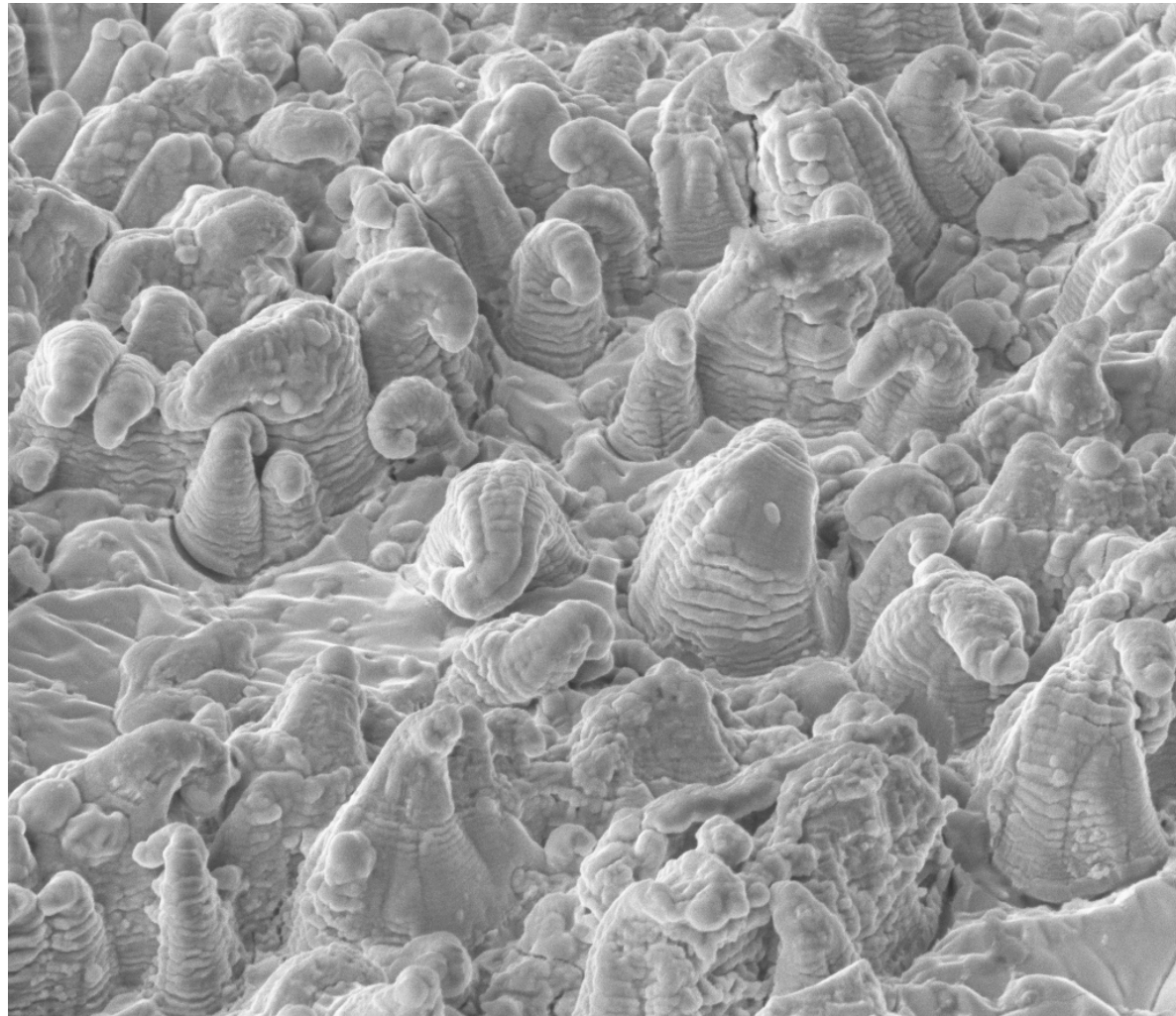


micro & nano - graph
Title:

Astro Space Worms

Description:

SnO structures on
metallic surface



02/02/05	E-Beam	Spot	Det	Mag	Tilt	SRot	2 μm
10:13:25	5.00 kV	3	CDM-E	16.0 kX	52.0°	0.0°	Empa 173: 437019

Magnification: **Scale on the picture**

Submitted by: **Stephan Meier**

Instrument: **FEI Strata 235**

Affiliation: **Empa, Materials Science & Technology, Dübendorf,
Switzerland**

MINE 2005 micro & nano - graph Contest

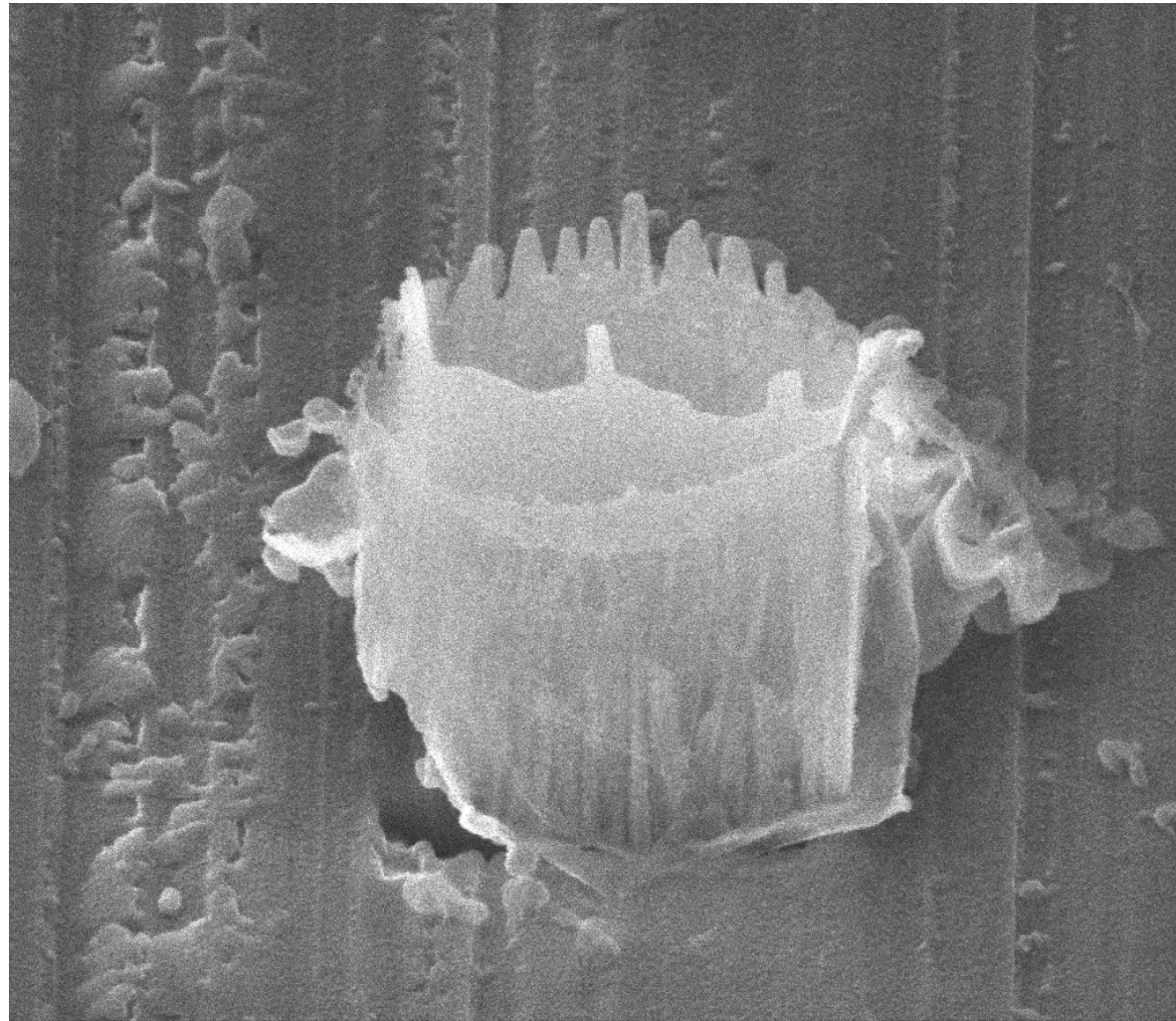


micro & nano - graph
Title:

Jellyfish

Description:

TEM lamella out of
frozen water droplet



03/22/05	E-Beam	Spot	Det	Mag	Tilt	SRot	1 μm
15:48:11	10.0 kV	3	CDM-E	35.0 kX	52.0°	0.0°	

Magnification: **Scale on the picture**

Submitted by: **Philipp Nellen**

Instrument: **FEI Strata 235**

Affiliation: **Empa, Materials Science & Technology, Dübendorf,
Switzerland**

MNE 2005 micro & nano - graph Contest

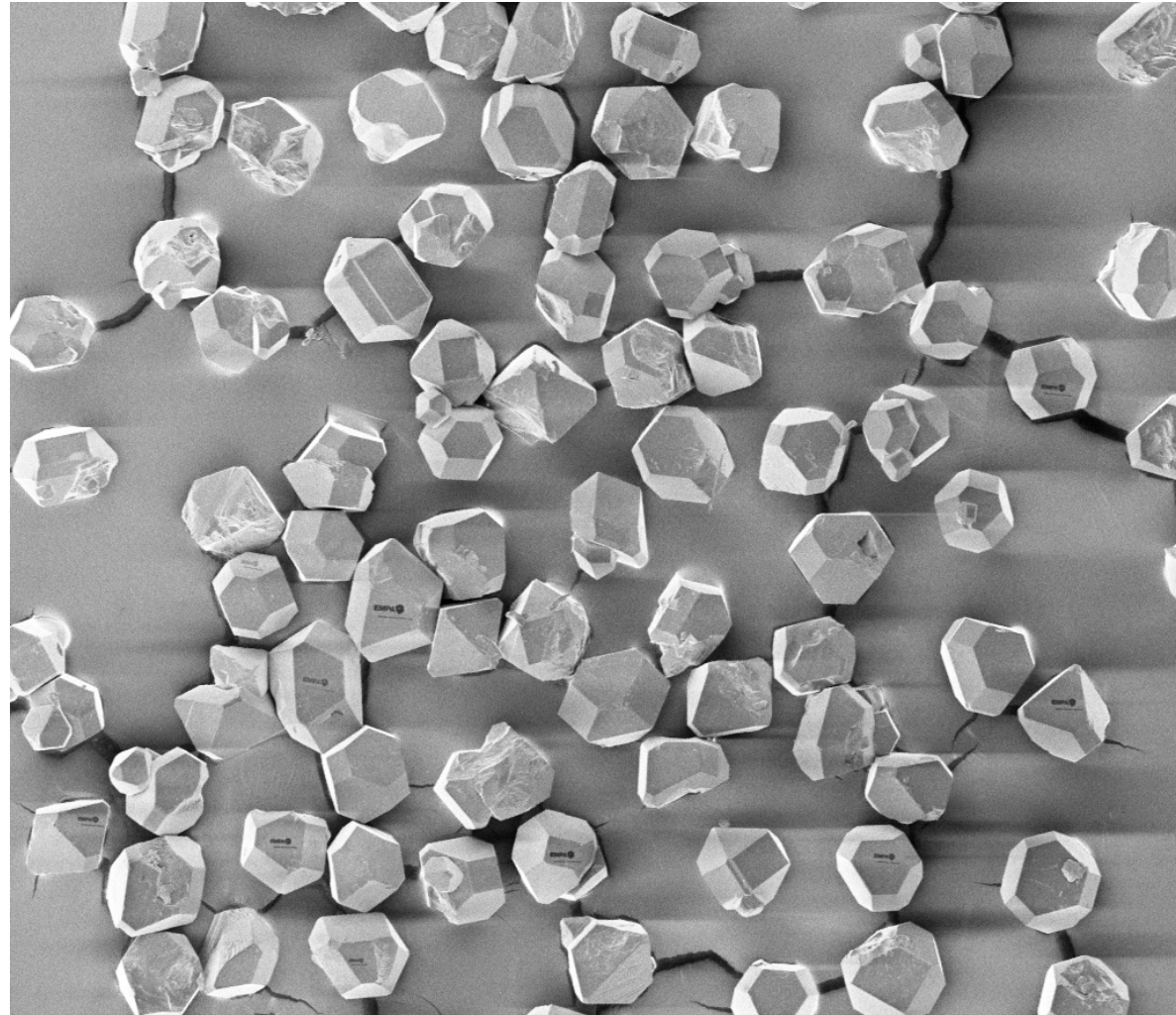


micro & nano - graph
Title:

Diamonds forever

Description:

Diamond crystals



06/30/05	E-Beam	Spot	Det	Mag	Tilt	SRot	200 μ m
09:21:01	5.00 kV	3	CDM-E	198 X	0.0°	0.0°	Empa173: 204305 Diamond/A

Magnification: Scale on the picture

Instrument: FEI Strata 235

Submitted by: Stephan Meier

Affiliation: Empa, Materials Science & Technology, Dübendorf,
Switzerland

MINE 2005 micro & nano - graph Contest

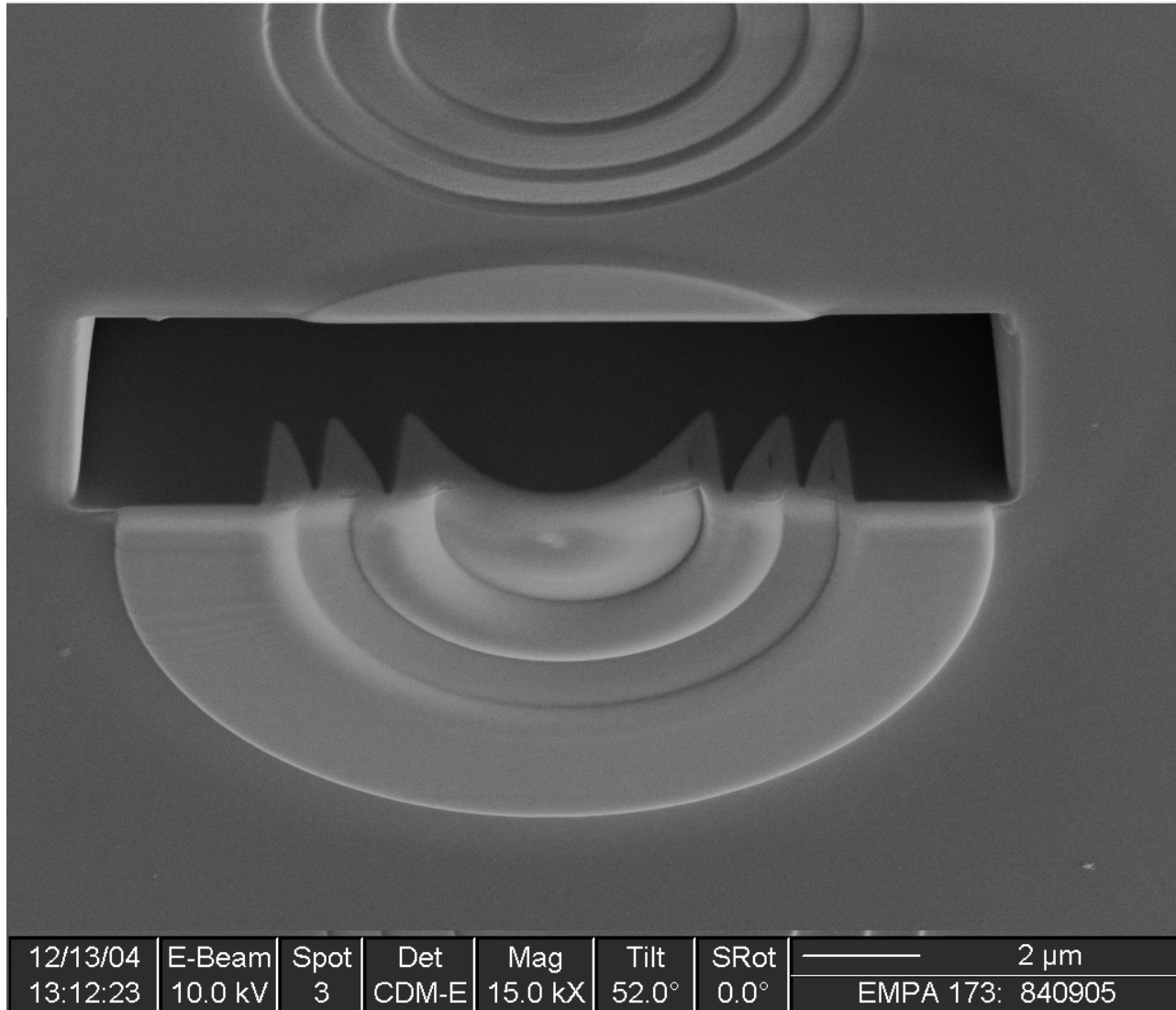


micro & nano - graph
Title:

Shark-fin soup

Description:

Cross section of Fresnel
lens structure in Si



Magnification: **Scale on the picture**

Submitted by: **Victor Callegari**

Instrument: **FEI Strata 235**

Affiliation: **Empa, Materials Science & Technology, Dübendorf,
Switzerland**

MINE 2005 micro & nano - graph Contest

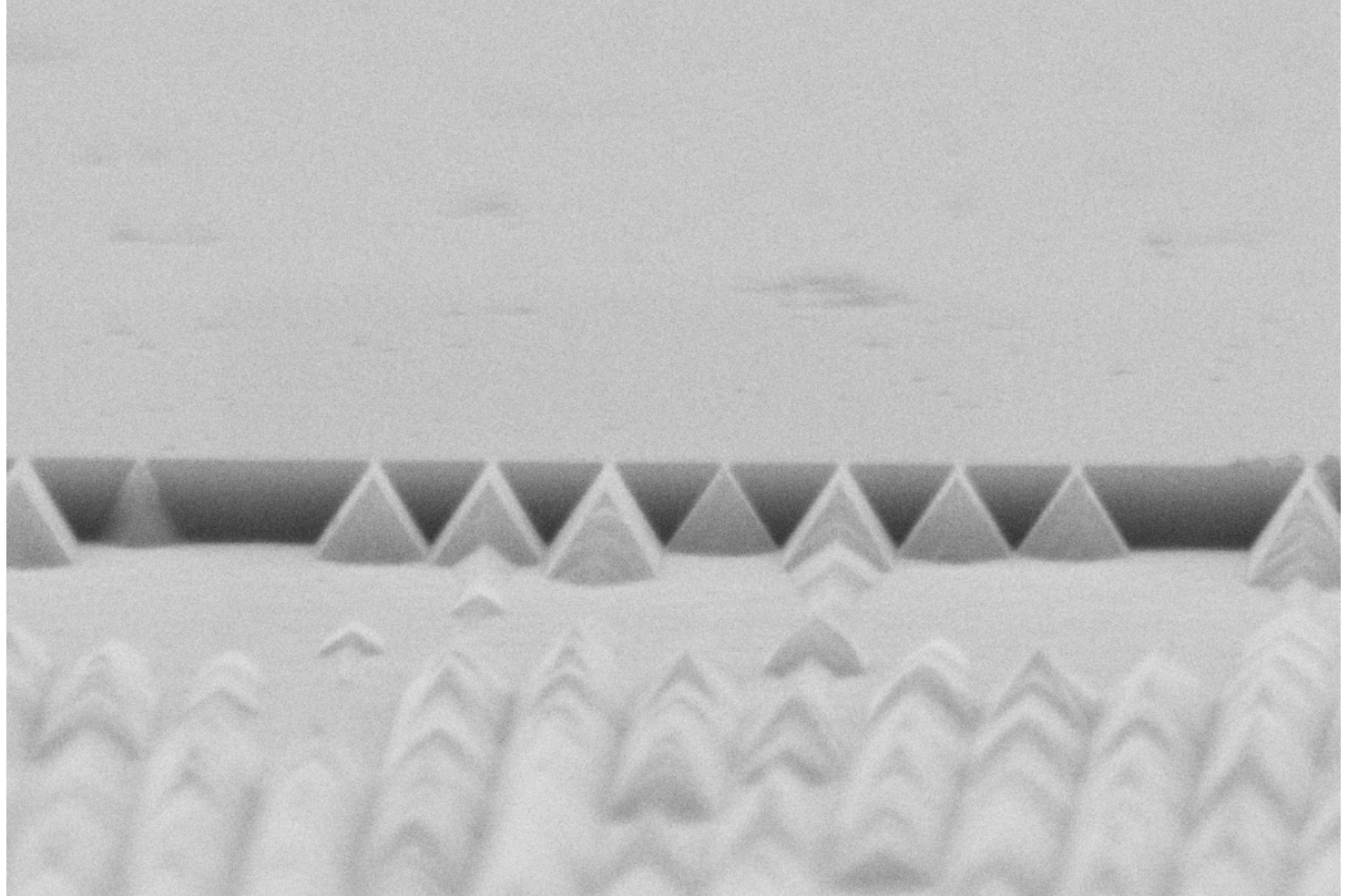


micro & nano - graph
Title:

NanoCamp

Description:

silicon structures made
by anisotropic wet
etching



IMB-CNM-CSIC
Mag = 100.00 K X

200nm
|-----|

EHT = 5.00 kV
WD = 8 mm

Signal A = InLens
Aperture Size = 20.00 μm

Date :9 Sep 2005
Time :17:46:31

Magnification: **Scale on the picture**

Submitted by: **Irene Fernandez and
Xavier Borrise**

Instrument: **LEO 1530 scanning electron microscope**

Affiliation: **Centro Nacional de Microelectronica, Barcelona
Spain**

MINE 2005 micro & nano - graph Contest



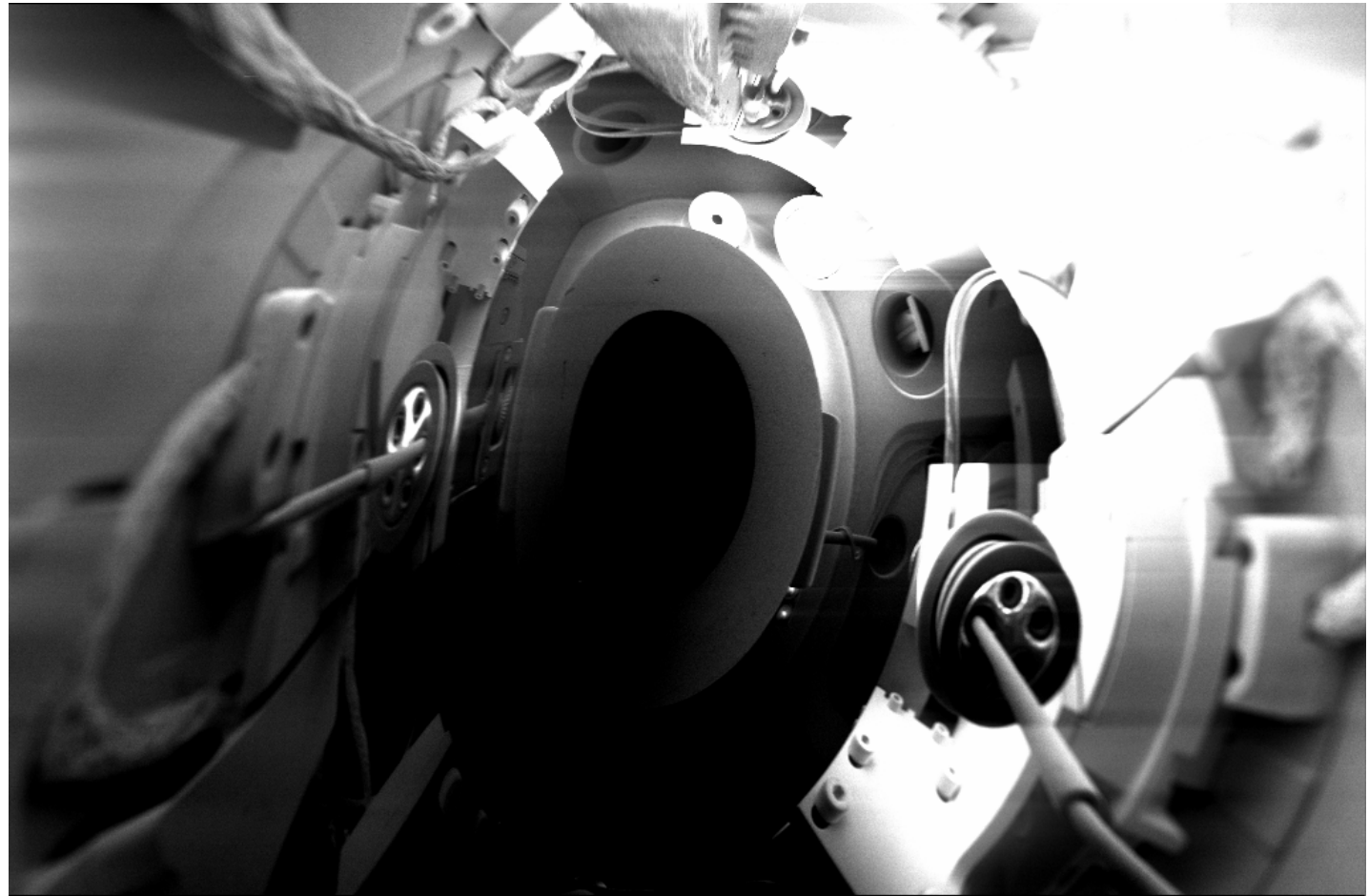
micro & nano - graph

Title:

The first thing the nanorobot saw.

Description:

SEM picture of insulating hemisphere on a sample being probed by a Zyvex Nanomanipulator. The result is an electron mirror that produces a wide angle view of the inside of the SEM. Two of the manipulator arms are clearly seen.



Mag = 33 X

200µm
|-----|

EHT = 5.00 kV
WD = 3 mm

Signal A = SE2
Photo No. = 1272

Date :30 Aug 2005
Time :18:04

Magnification: 33X

Submitted by: Christof Baur &
Aaron Geisberger

Instrument: Leo 1530 SEM

Affiliation: Zyvex Corporation, Richardson, Texas
USA

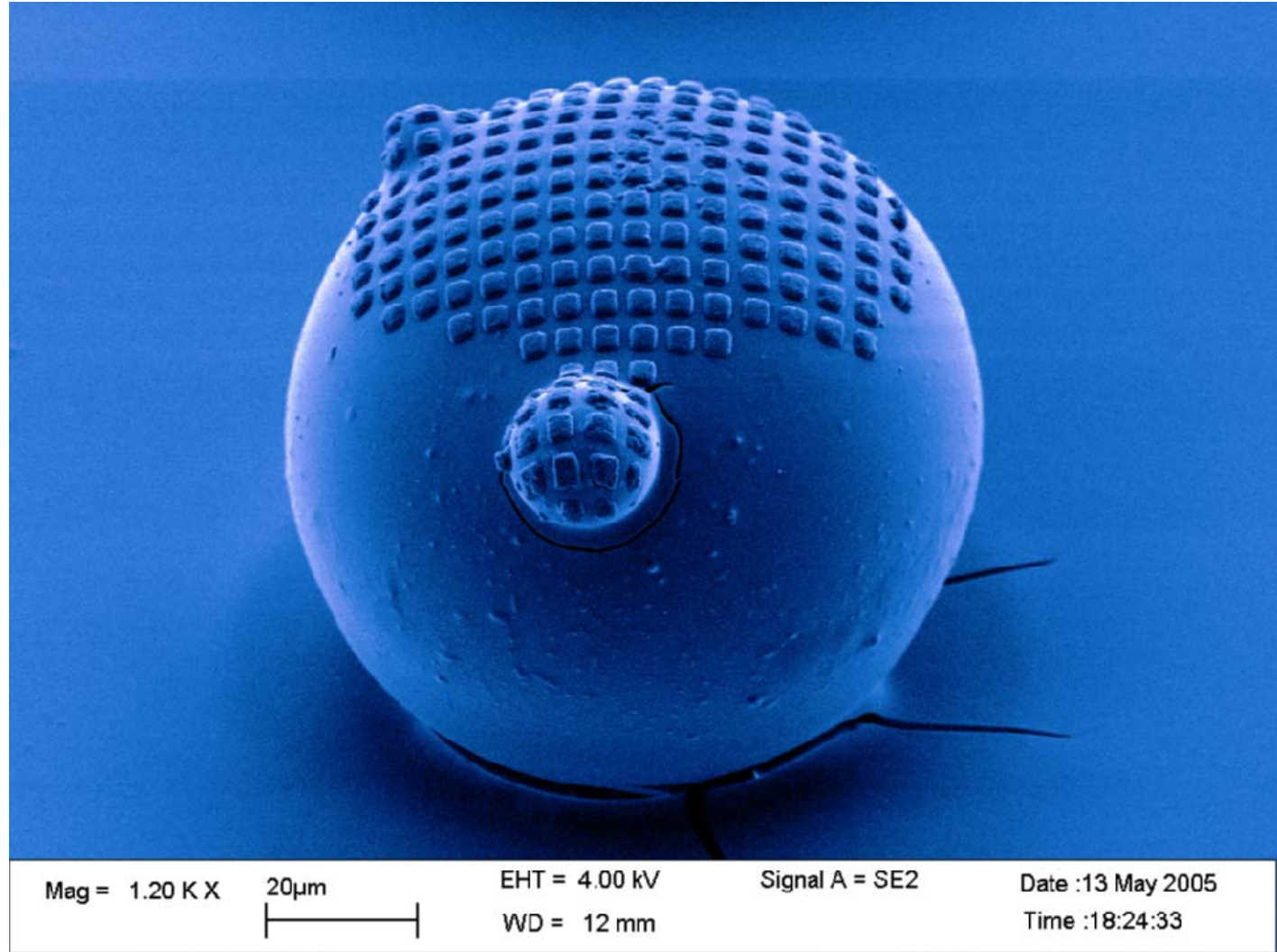


micro & nano - graph
Title:

Micro Smurf

Description:

Polystyrene nanoparticles with a diameter of 500 nm printed on top of a 100 μ m glass bead using a process similar to micro-contact printing.

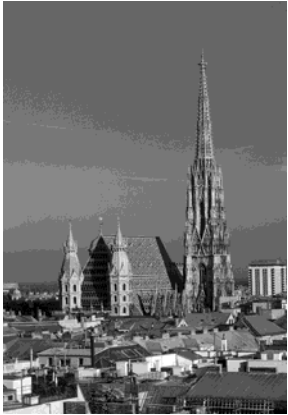


Magnification: Scale on the picture

Submitted by: Laurent Malaquin

Instrument: LEO SEM 1550

Affiliation: IBM Research, Zurich Research Laboratory
Switzerland

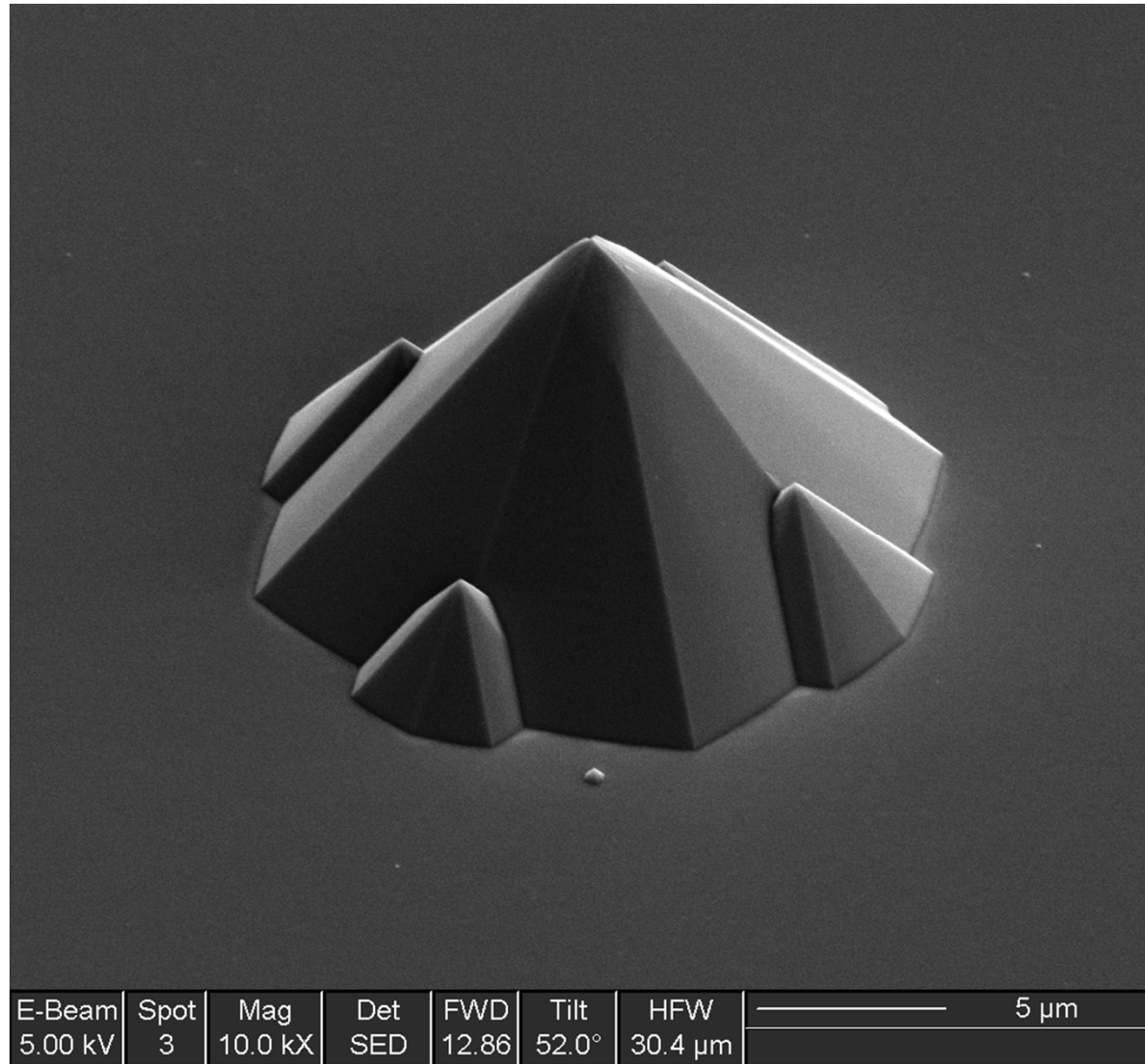


micro & nano - graph
Title:

Keops

Description:

Silicon pyramid. We were trying to develop some new method to fabricate AFM tips and etching Silicon with TMAH we found this structure.



Magnification: **Scale on the picture**

Instrument: **FEI dual beam strata**

Submitted by: **Guillermo Villanueva**

Affiliation: **Centro Nacional de Microelectrónica, Barcelona, Spain**

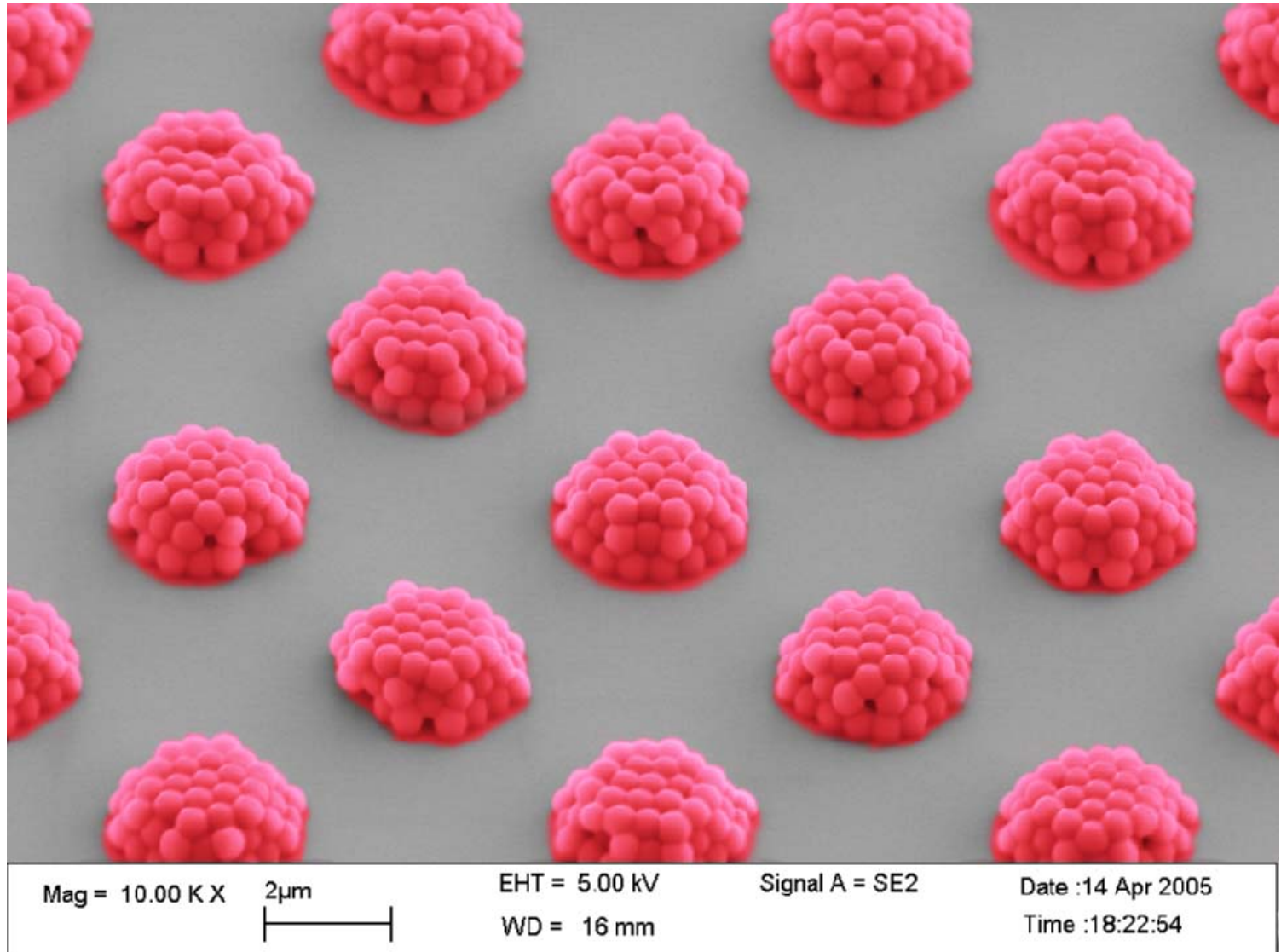


micro & nano - graph
Title:

Micro Rasberries

Description:

Polystyrene nanoparticles with a diameter of 500nm self-assembled on a PDMS template and transferred on a silicon substrate.



Magnification: Scale on the picture

Submitted by: Laurent Malaquin

Instrument: LEO SEM 1550

Affiliation: IBM Research, Zurich Research Laboratory
Switzerland

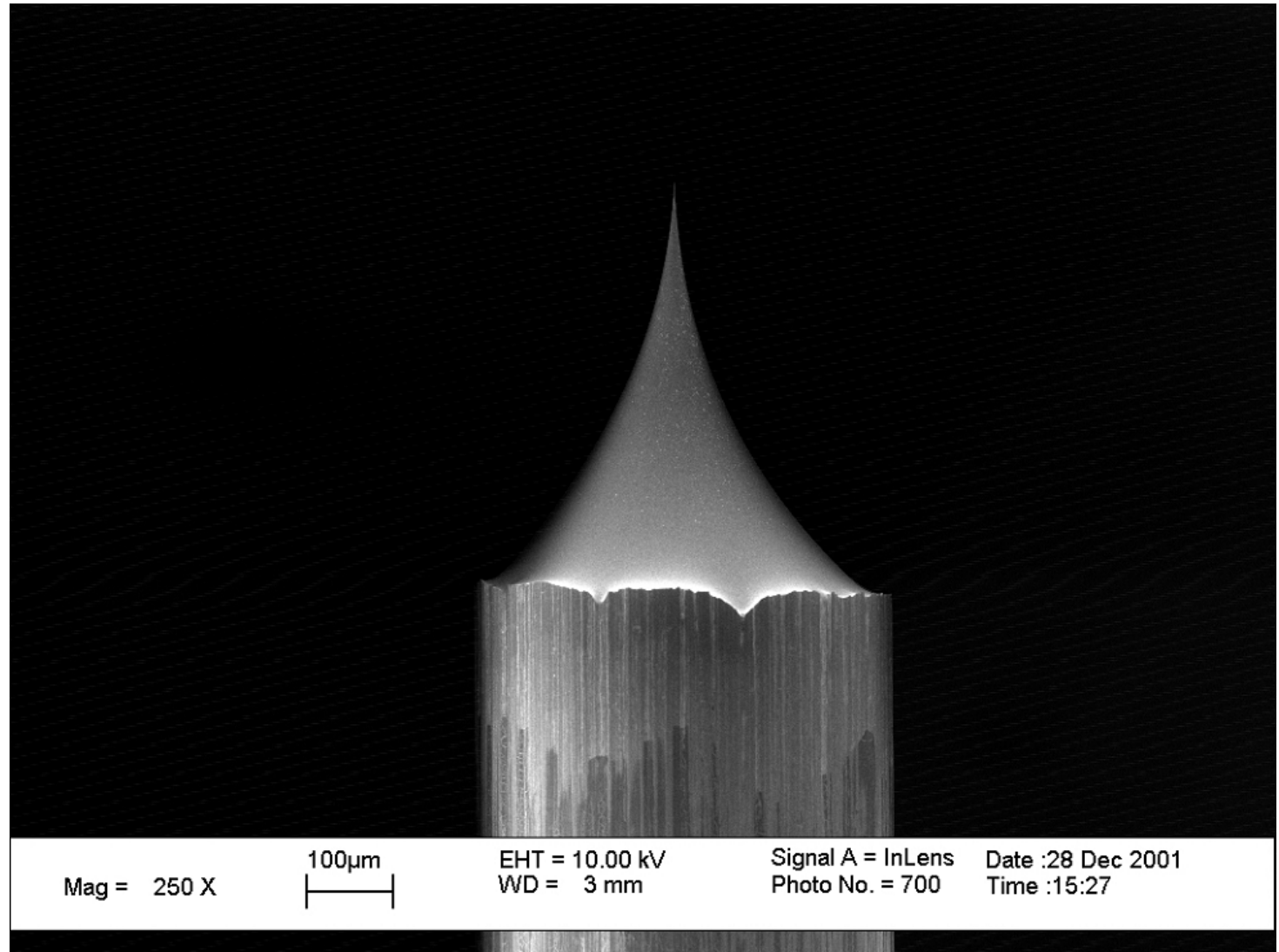


micro & nano - graph
Title:

The Spire

Description:

Electrochemical etching of a tungsten wire produces an extremely fine probe and a spire for pico-parishioners.



Magnification: **33X**

Submitted by: **Richard Stallcup**

Instrument: **Leo 1530 SEM**

Affiliation: **Zyvex Corporation, Richardson Texas
USA**

MINE 2005 micro & nano - graph Contest

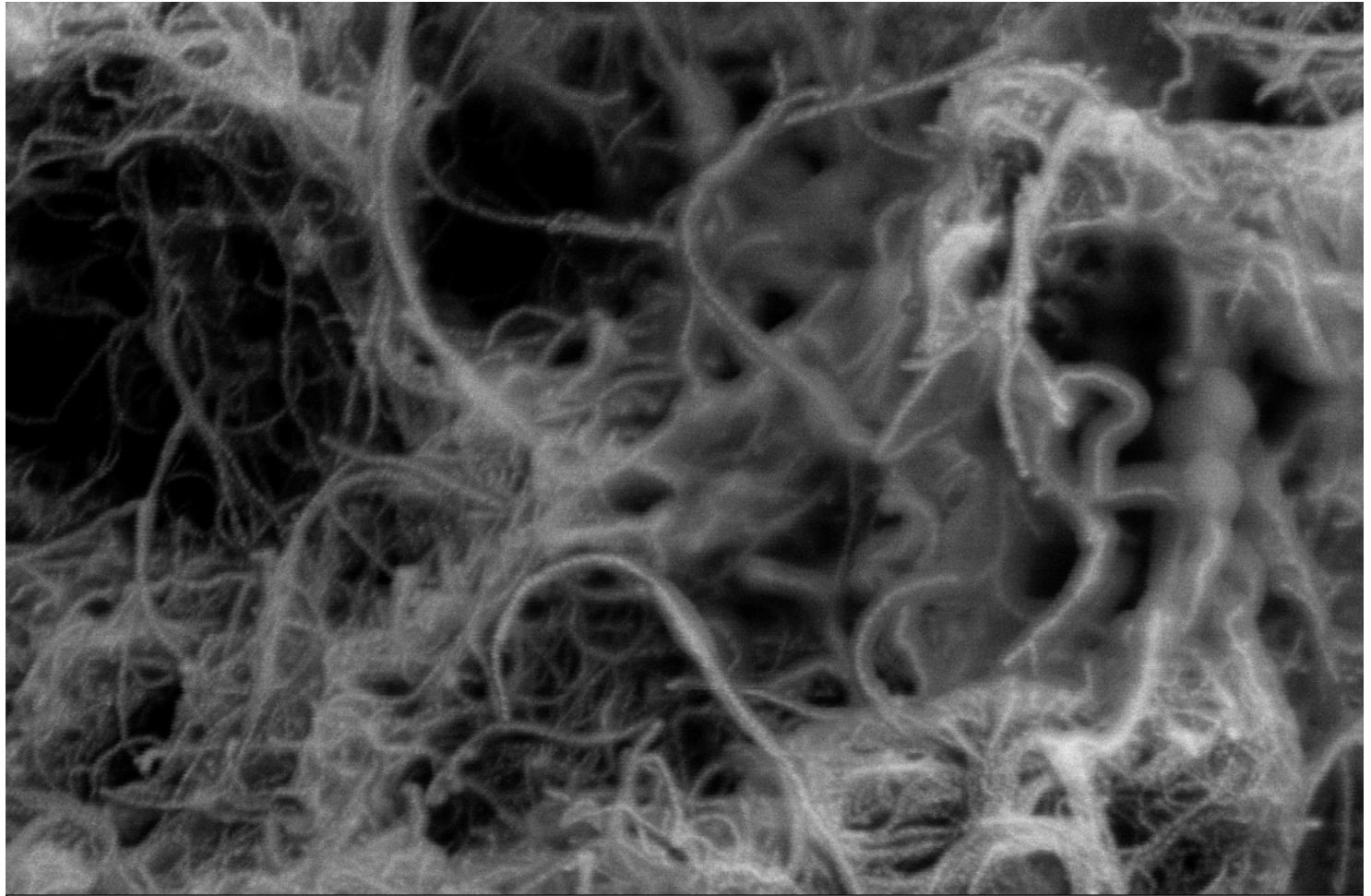


micro & nano - graph
Title:

Angel Hair CNT Pasta

Description:

Carbon Nanotube pasta is low on calories and carbohydrates. **This product has not been genetically modified.**



Mag = 123.31 K X 200nm
|-----|

EHT = 3.00 kV
WD = 8 mm

Signal A = SE2
Photo No. = 657

Date :30 Jun 2005
Time :11:46

Magnification: **33X**

Submitted by: **William Greensage**

Instrument: **Leo 1530 SEM**

Affiliation: **Zyvex Corporation, Richardson Texas
USA**