



“Mind the gap!”

Description:

I took the SEM image in march 2009 of this few-nm wide gap in a gold nanowire (on SiO₂) created by joule heating (forcing a current through the wire until it melts). This year (January, 2010) I found an identical ‘macro-gap’ during a molecular electronics conference in Emmetten, Switzerland!



Magnification: Field-of-view: 454 nm.

Instrument: SEM: Zeiss LEO 1550, Camera: Canon IXUS 40

Submitted by: Dr. Tobias Blom

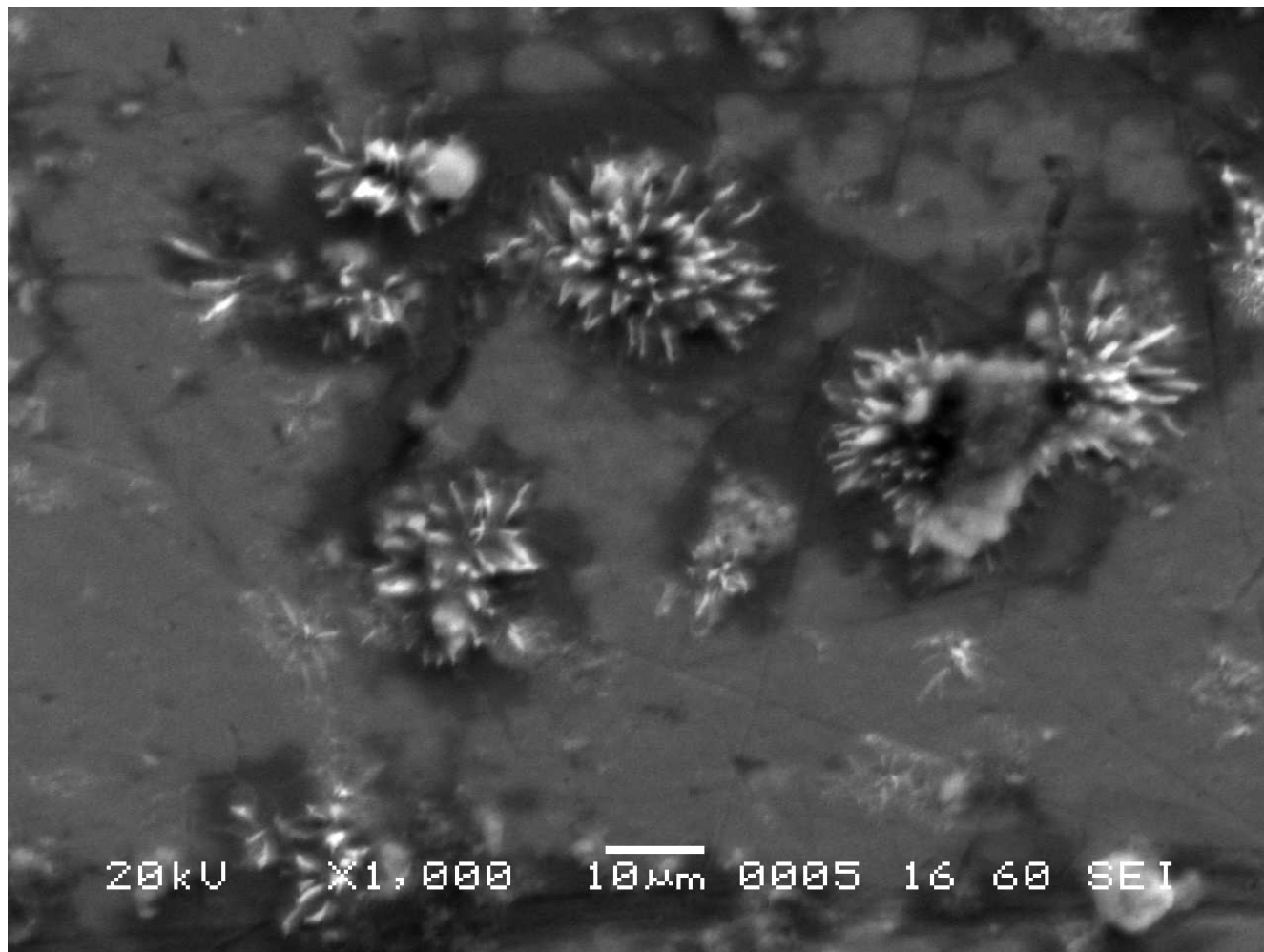
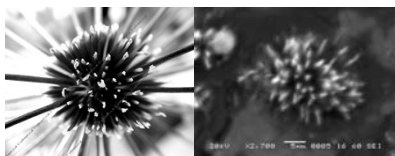
Affiliation: Division of Electron Microscopy and Nano-engineering, The Angstrom laboratory, Uppsala, Sweden.



micro & nano - graph Title:
“ Bi_2S_3 nano starburst flower”

Description:

Bi_2S_3 nanoparticles formed regular shaped structures during the synthesis. They formed rod like structure when synthesized using a polymer matrix.



Magnification: 1000X

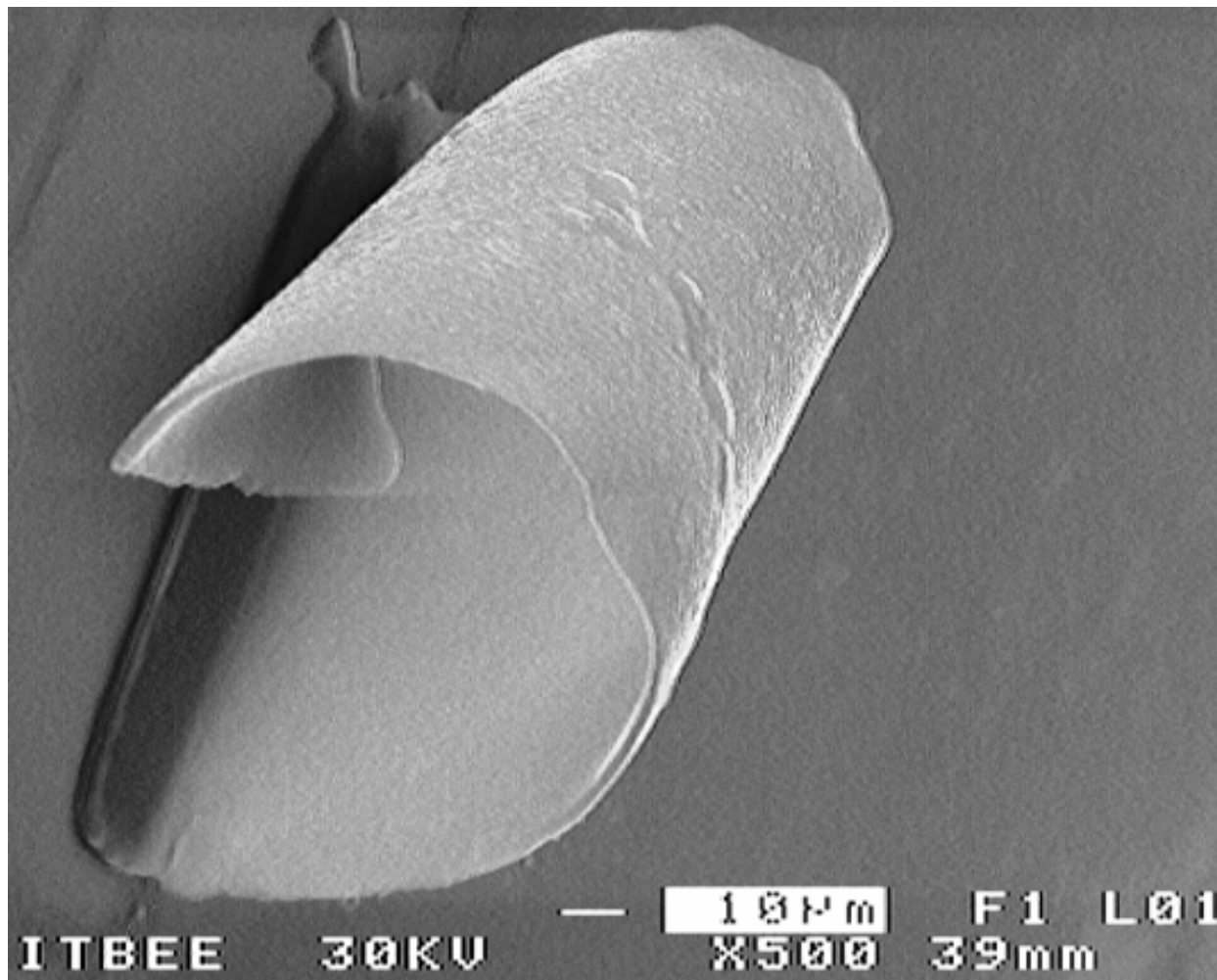
Submitted by: Dhananjay Bodas

Instrument: Jeol JSM 35CF Scanning Electron Microscope

Affiliation: Agharkar Research Institute, Pune, India

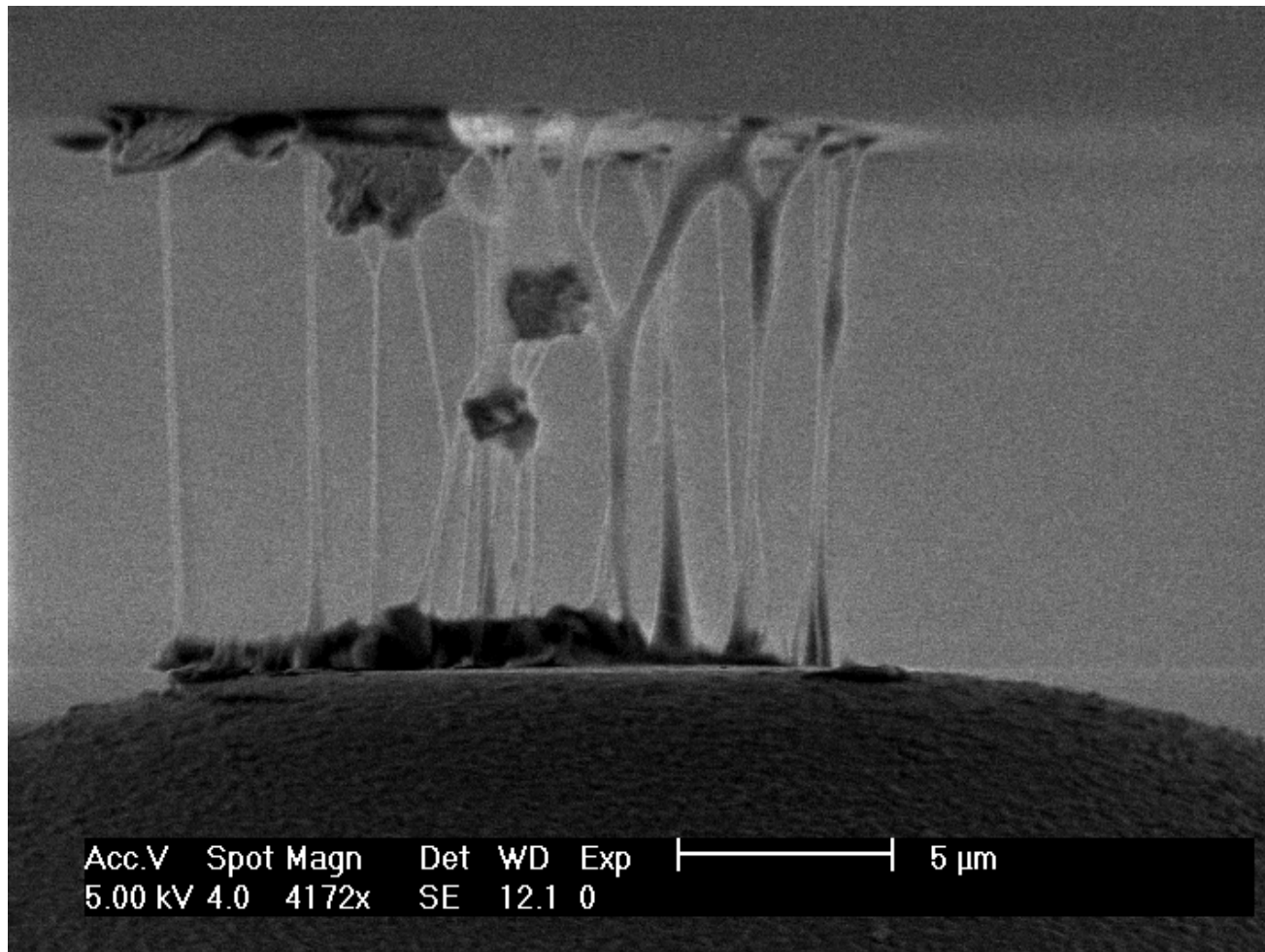
**Description:**

SU8 micro roll formed during fabrication SU8 cantilevers. The cantilever beam curled due to stress in the film.

**Magnification:** 500X**Submitted by:** Dhananjay Bodas**Instrument:** Raith 150 Scanning Electron Microscope**Affiliation:** Agharkar Research Institute, Pune, India

**Description:**

Filamentation of PDMS due to retraction of a sphere from a nanoscale thick film. What makes it interesting is the possibility of it curing under electron irradiation during deformation



Acc.V 5.00 kV Spot 4.0 Magn 4172x Det SE WD 12.1 Exp 0 | 5 μm

Magnification: 4172X

Submitted by: James Bowen

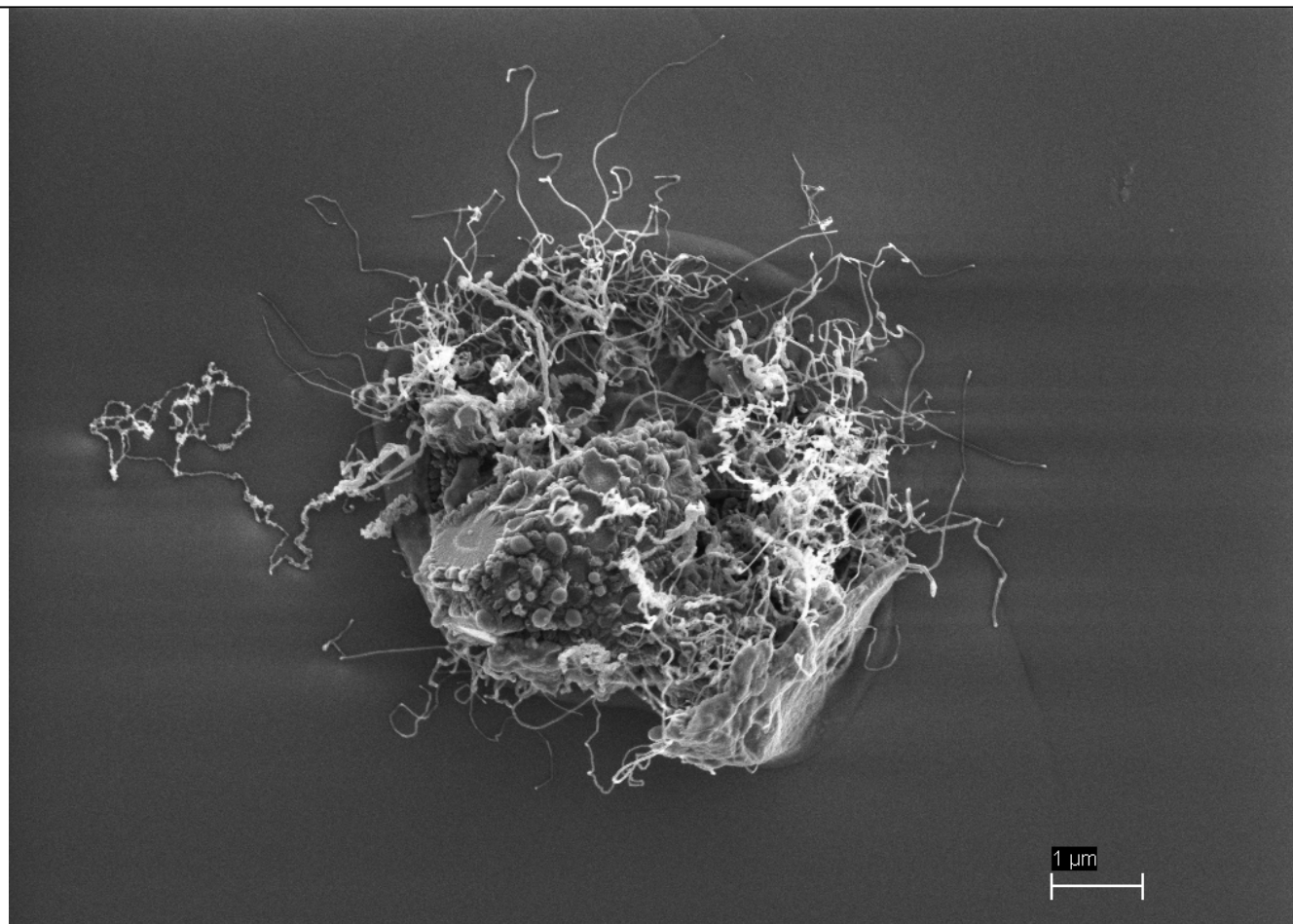
Instrument: Philips XL-30 FEG ESEM with Oxford Inca EDS

Affiliation: University of Birmingham, UK



Nano Pot-Pourri bowl- makes your SEM smell good!

Description:
Single-walled carbon nanotubes grown from Ferritin catalyst nanoparticles. The tubes are about 2nm in size, but glow brightly in an SEM. In this case, the catalyst particles were clustered around a dirt particle, causing many tubes to grow out and form nice patterns.



Mag = 26.49 K X WD = 2.1 mm Stage at T = -0.0 °

Signal A = InLens
EHT = 2.40 kV

Time :13:38:47
Date :8 Jul 2010

Chikkadi
FIRST

Magnification: 26.49KX

Submitted by: Kiran Chikkadi

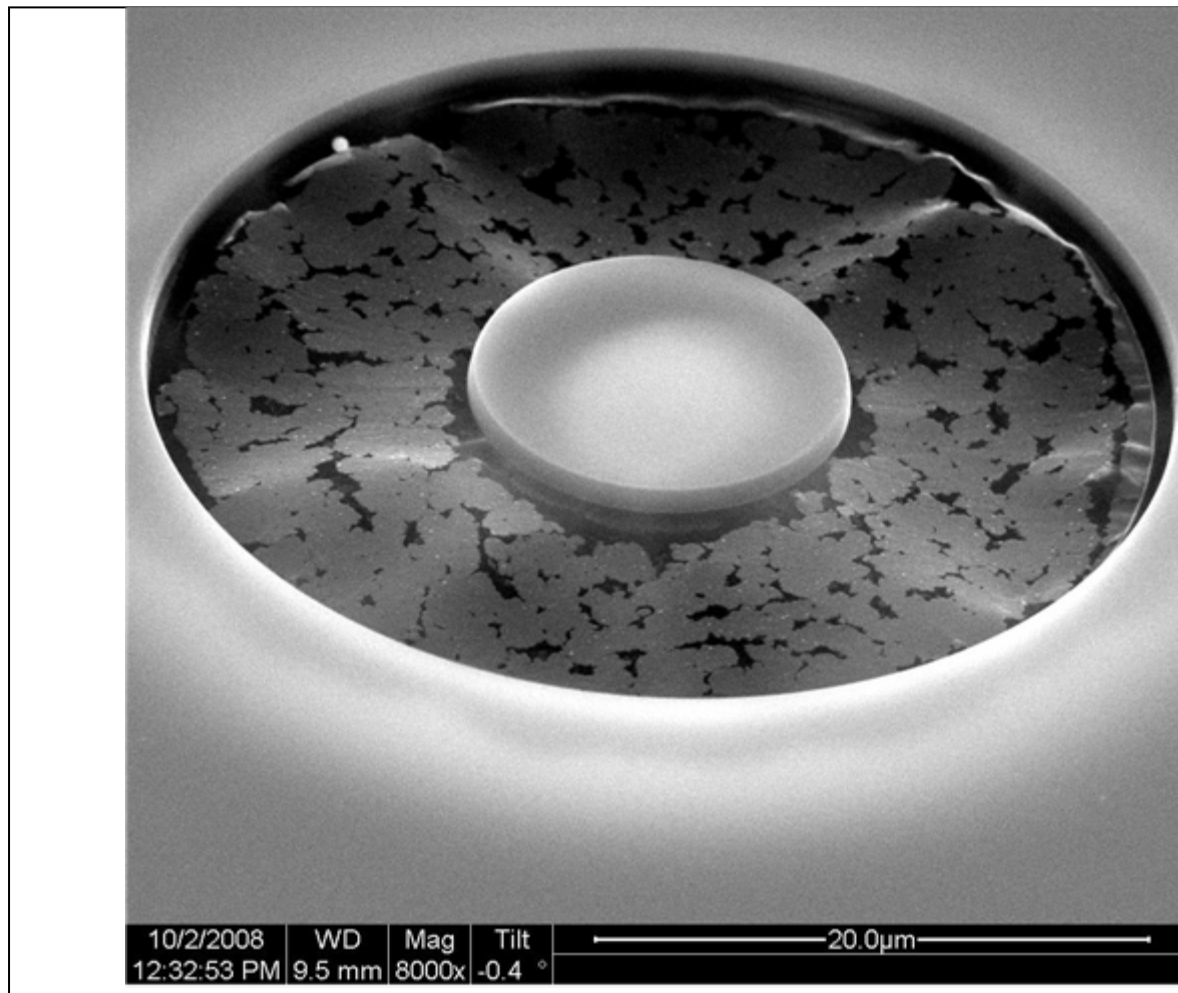
Instrument: Zeiss Ultra-55

Affiliation: Micro and nanosystems,
ETH Zurich, Switzerland

**Description:**

Very thin layer(looks like duckweed) is suspended from a disk(lotus leaf) and boundary. Si disk was made by FIB etching, and etching Si with XeF₂.

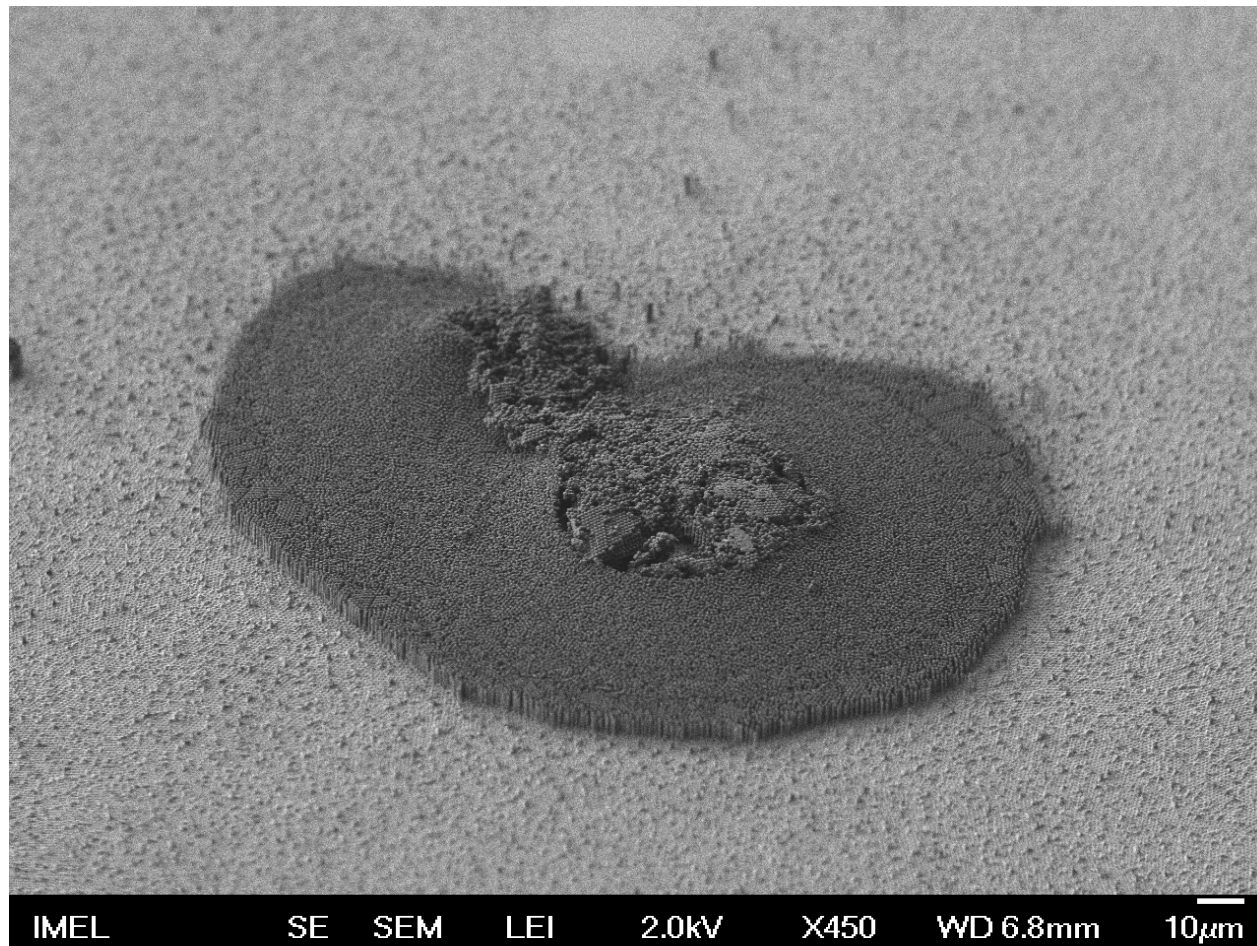
Ga from FIB was implanted on Si when it was etched, Ga implanted Si surface couldn't be etched by XeF₂, and very thin layer was remained with Si disk

**Magnification: 8KX****Submitted by: Hyeunseok Choi****Instrument: FEI , Quanta****Affiliation: KITECH.,****Manufacturing system R&D Dept., Korea**



Description:

Ps etched Particles
on silicon substrate



Magnification: X450

Submitted by: Ellinas Kosmas

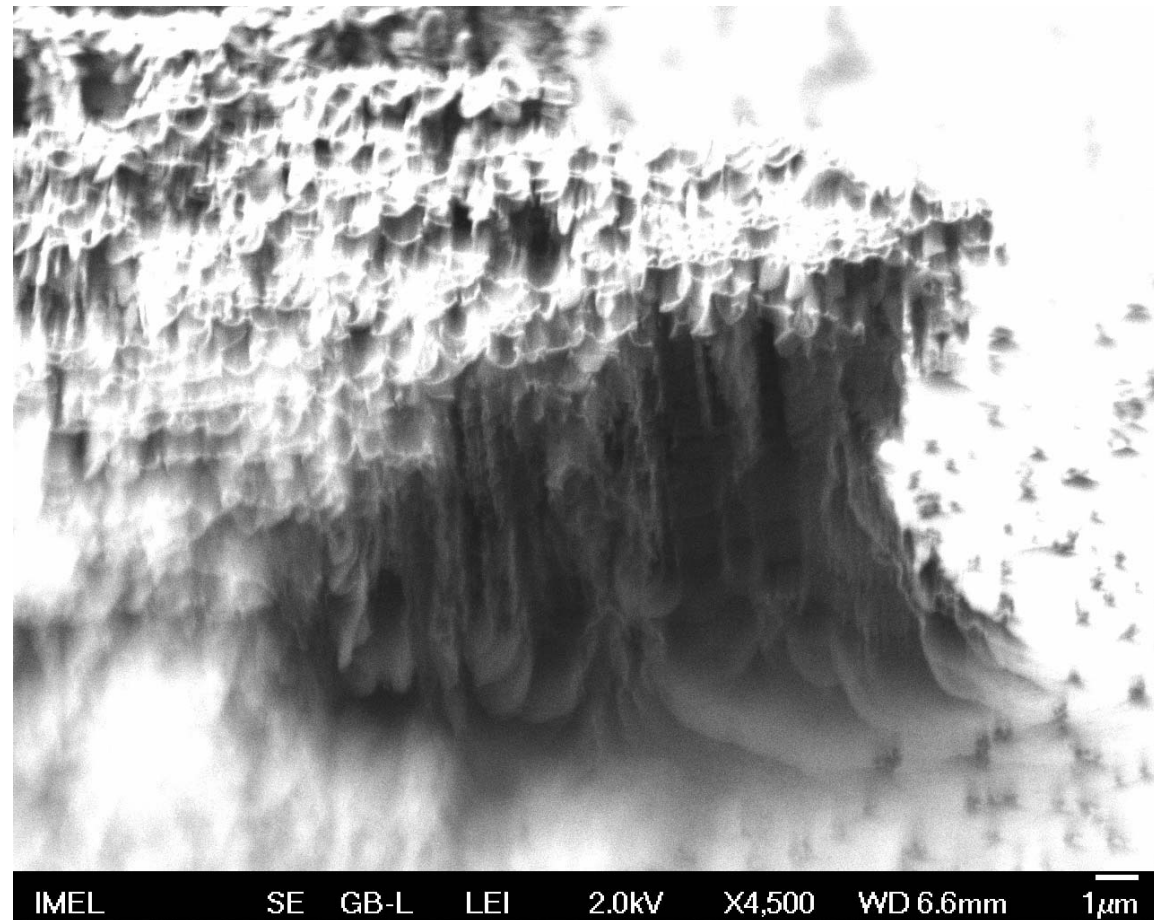
Instrument: Jeol-Jsm-7401F-Feg Sem

Affiliation: NSCR Demokritos, IMEL

Athens, Greece

**Description:**

Ps etched Particles
on silicon substrate
by Bosch Process



Magnification: X4500

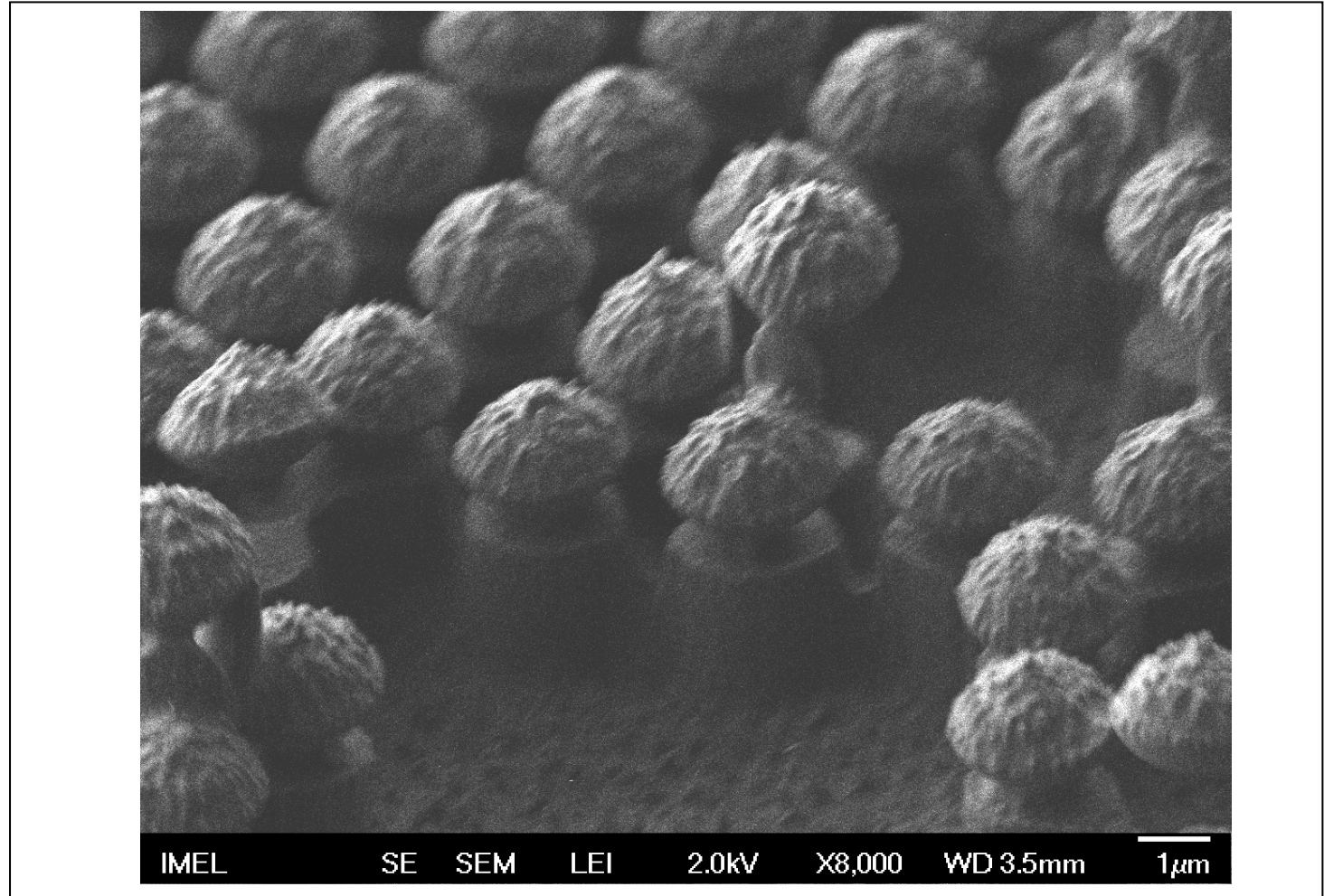
Submitted by: Ellinas Kosmas

Instrument: Jeol-Jsm-7401F-Feg Sem

Affiliation: NSCR Demokritos, IMEL
Athens, Greece

**Description:**

Ps etched Particles
on polymer
substrate.



Magnification: X8000

Submitted by: Ellinas Kosmas

Instrument: Jeol-Jsm-7401F-Feg Sem

Affiliation: NSCR Demokritos, IMEL

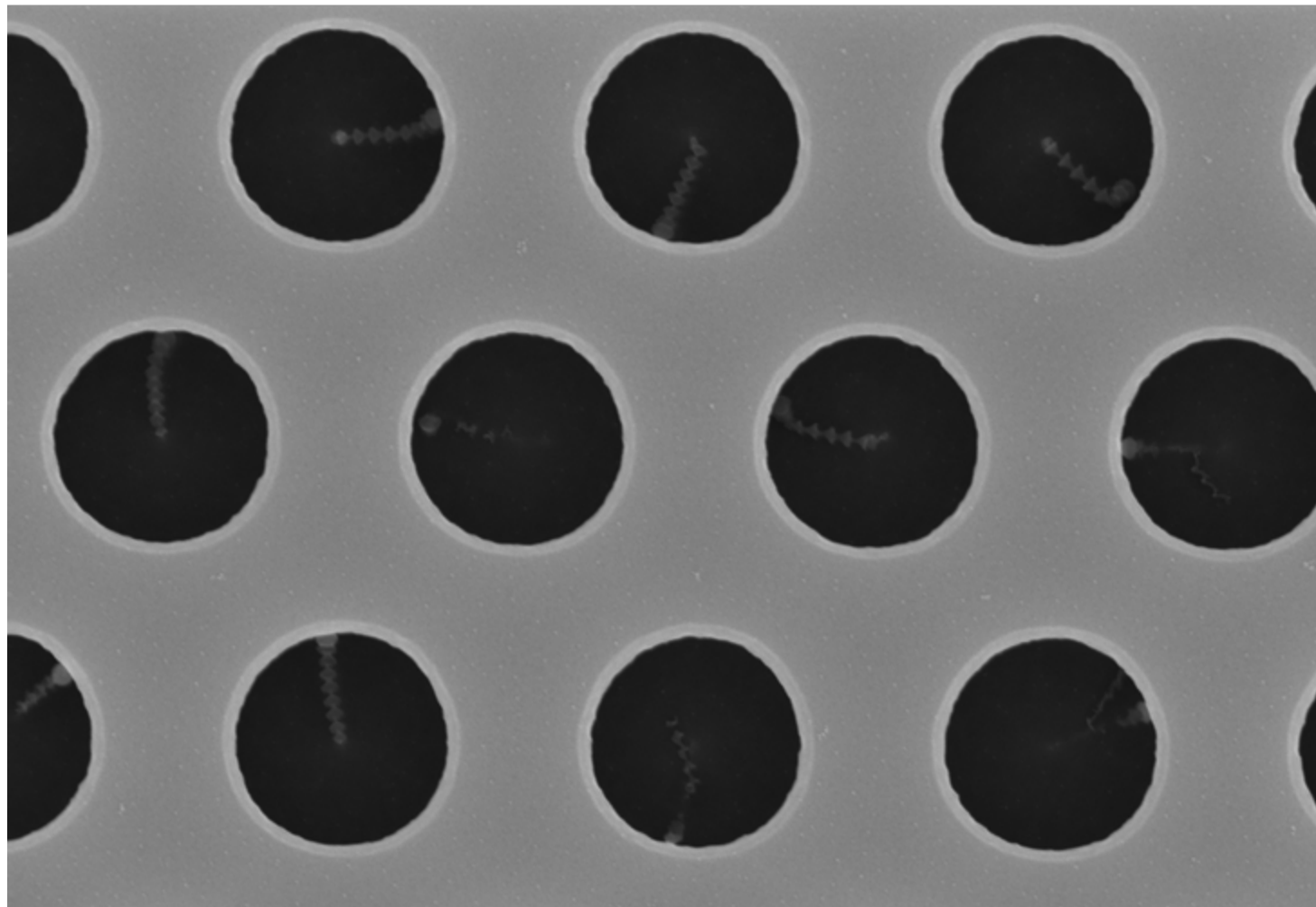
Athens, Greece



Dead Fish Farm

Description:

Topview of deep holes etched in silicon. On the bottom of each hole resides a fishbone structure created during DRIE. In the final device, structures are supposed to stand upstraight in the middle of each hole, but in this case, the anisotropic etch profile has bent the fishbone structure at the bottom end, creating this dead fish farm.



Magnification: 13.9 KX

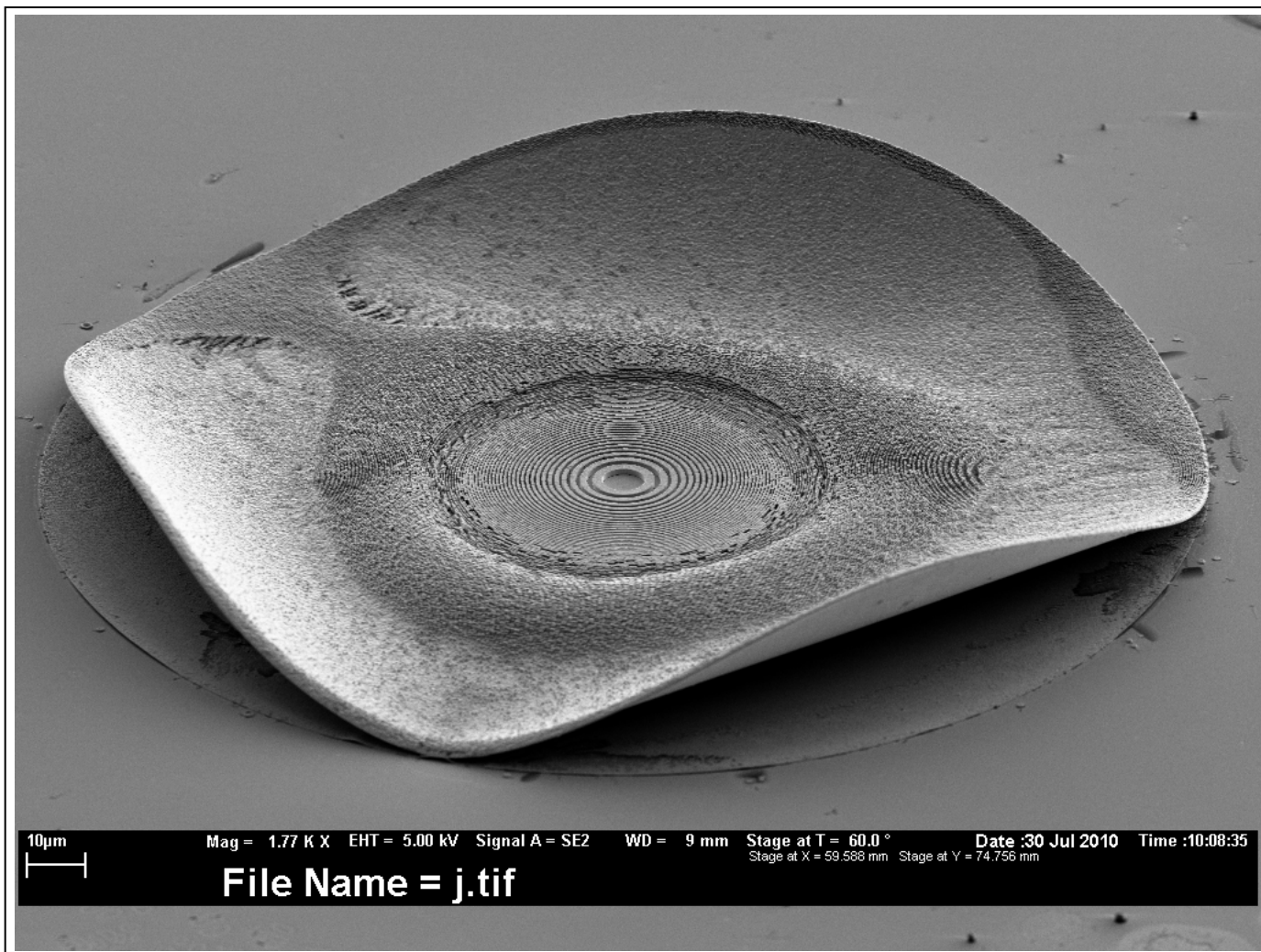
Submitted by: Sebastian Gautsch

Instrument: Raith 150

Affiliation: Sensors Actuators and Microsystems Laboratory,
EPFL, Neuchâtel, Switzerland

**Description:**

Stress in an overplated Fresnel zone plate made of Au caused it to bow and delaminate from the substrate.



Magnification: 1.77KX

Submitted by: Sergey Gorelick

Instrument: Zeiss SUPRA 55V

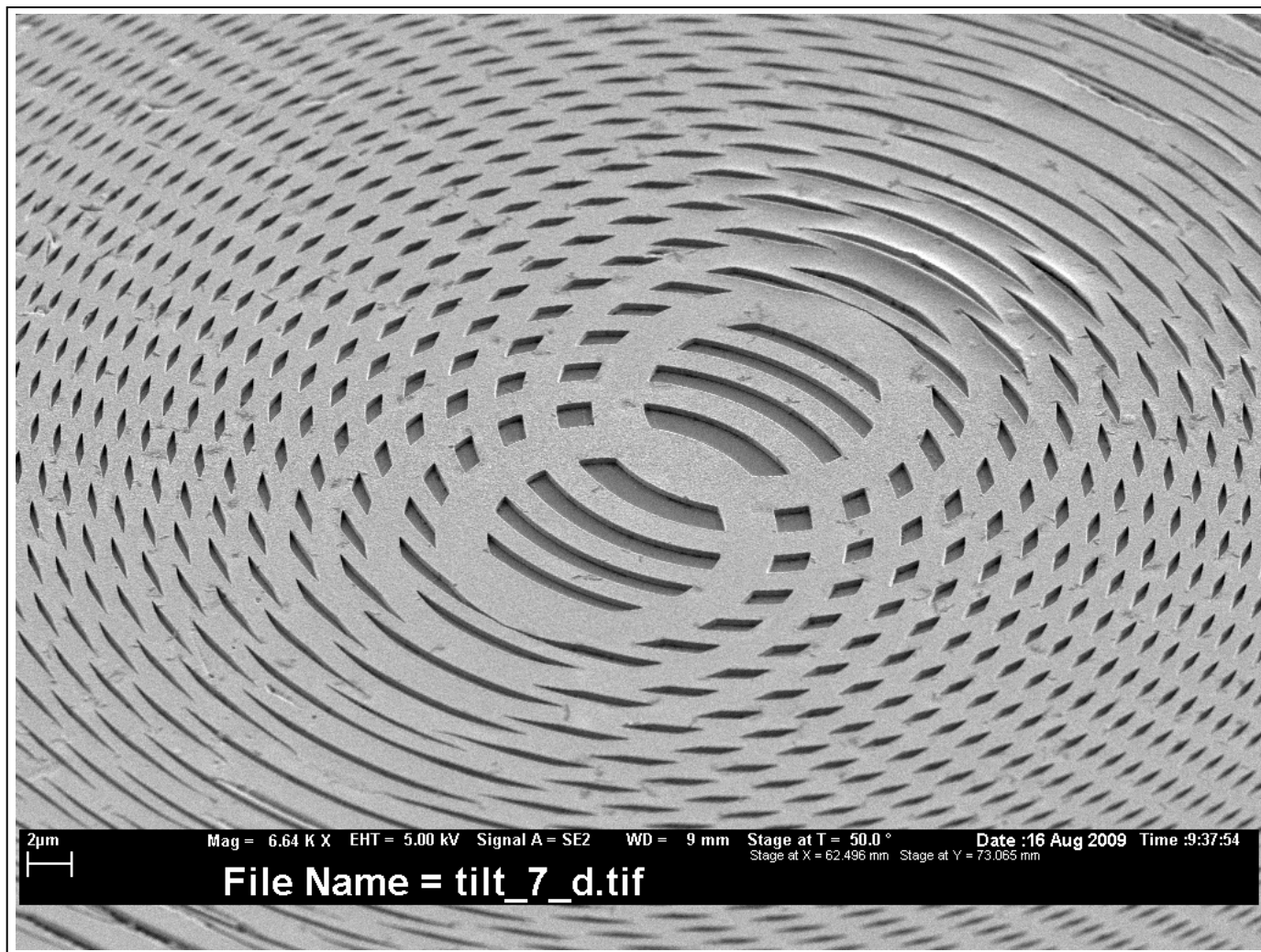
Affiliation: Paul Scherrer Institut, Villigen, Switzerland



micro & nano - graph Title:
“Ripples on a golden pond”

Description:

Two Fresnel zone plates were exposed with a relative shift between each other. The pattern was transferred into gold by electroplating. The central area of the pattern resembles the infinity sign, ripples on a water surface or a number 8.



Magnification: 6.64KX

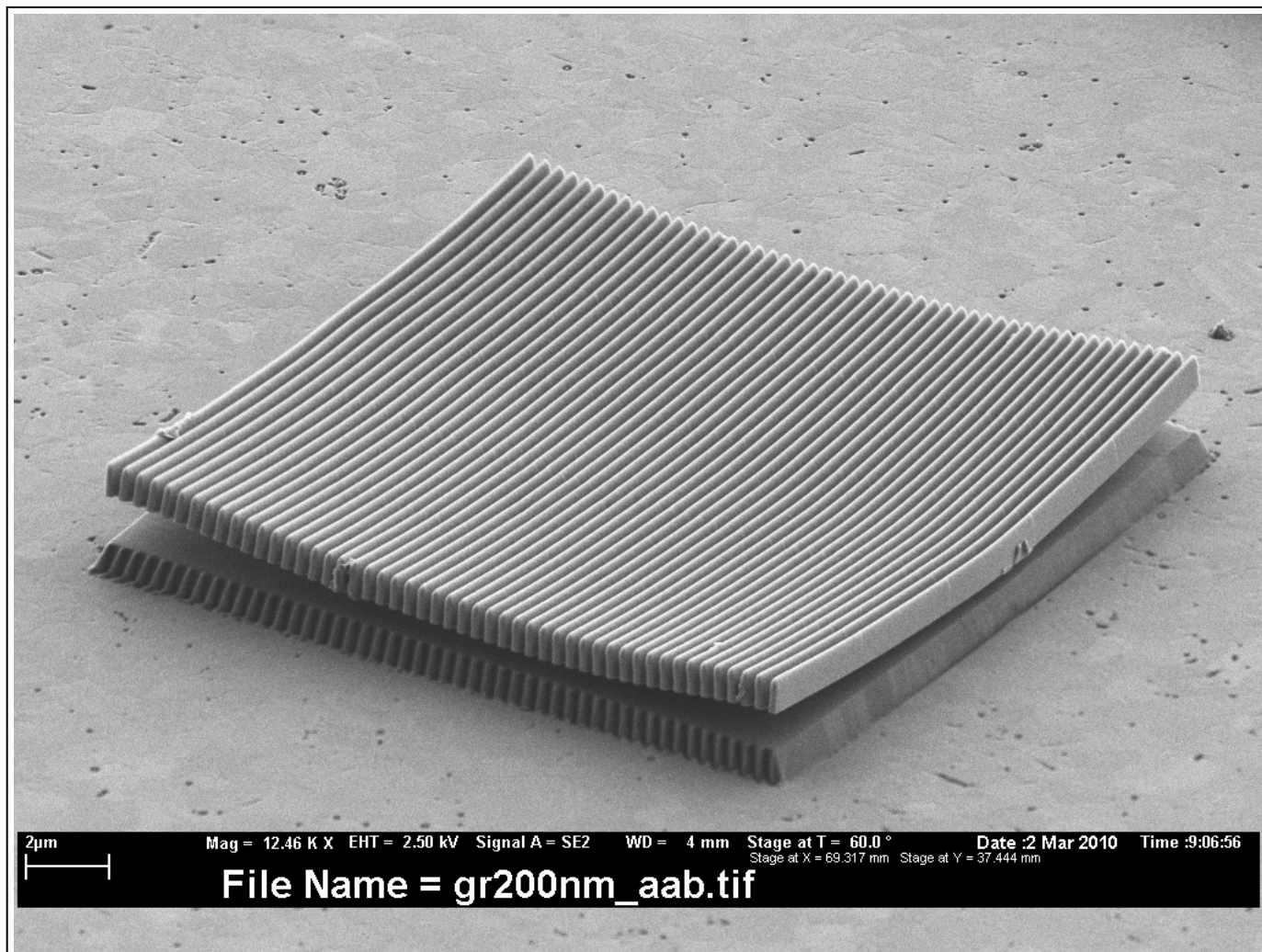
Submitted by: Sergey Gorelick

Instrument: Zeiss SUPRA 55V

Affiliation: Paul Scherrer Institut, Villigen, Switzerland

**Description:**

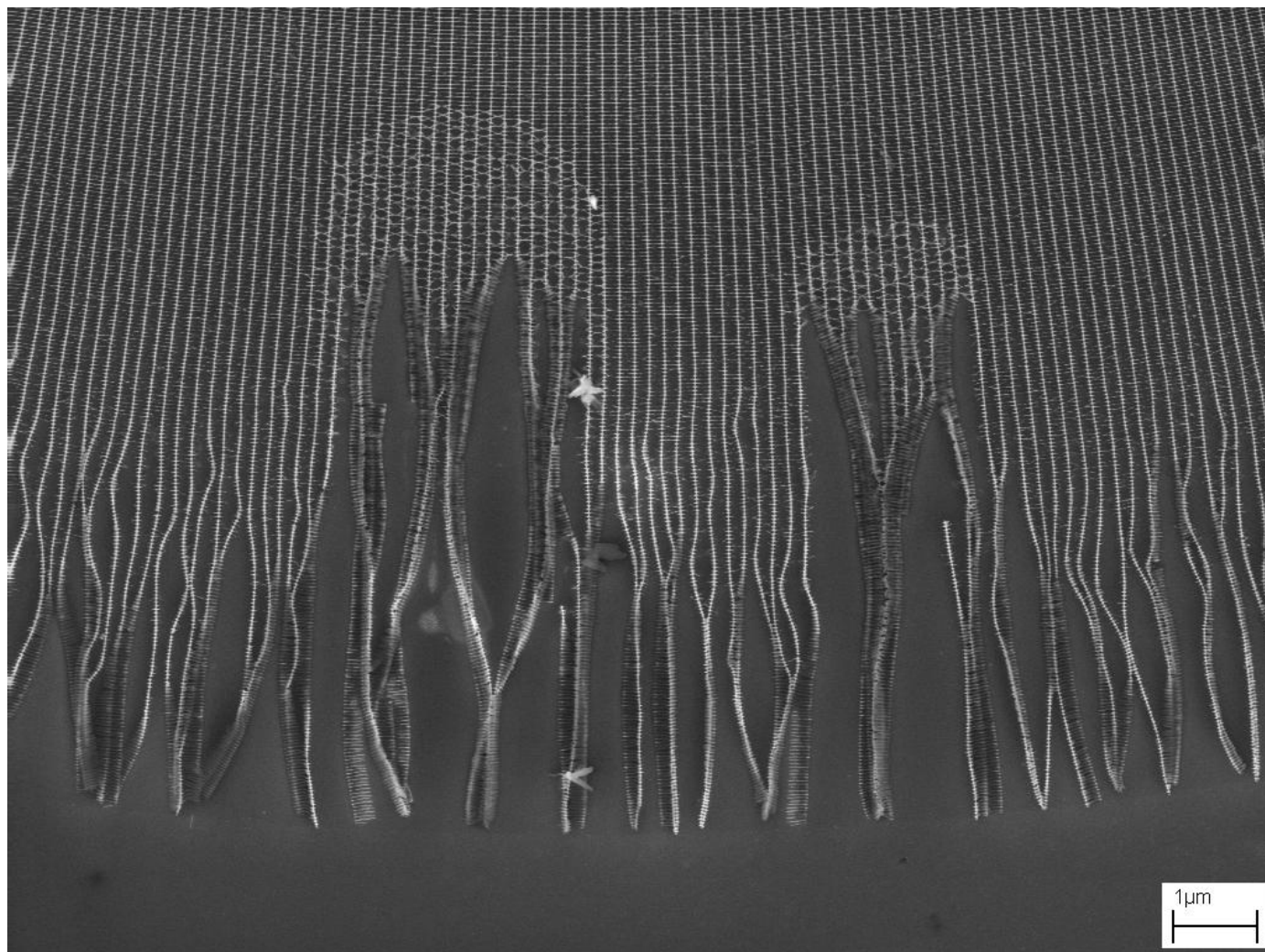
HSQ mask was used to etch into diamond. However, the HSQ layer was too thick and did not develop to the diamond surface. The etching formed a pedestal for the glassy mask, which bowed due to an internal stress and delaminated from the diamond.

**Magnification:** 12.46KX**Submitted by:** Sergey Gorelick**Instrument:** Zeiss SUPRA 55V**Affiliation:** Paul Scherrer Institut, Villigen, Switzerland

**Description:**

Defective HSQ
grating after e-
beam lithography
and development.

Can you find a
mosquito and a
moth?



Magnification: 25KX

Submitted by: Vitaliy A, Guzenko

Instrument: SEM Zeiss Supra 55VP

Affiliation: Paul Scherrer Institut

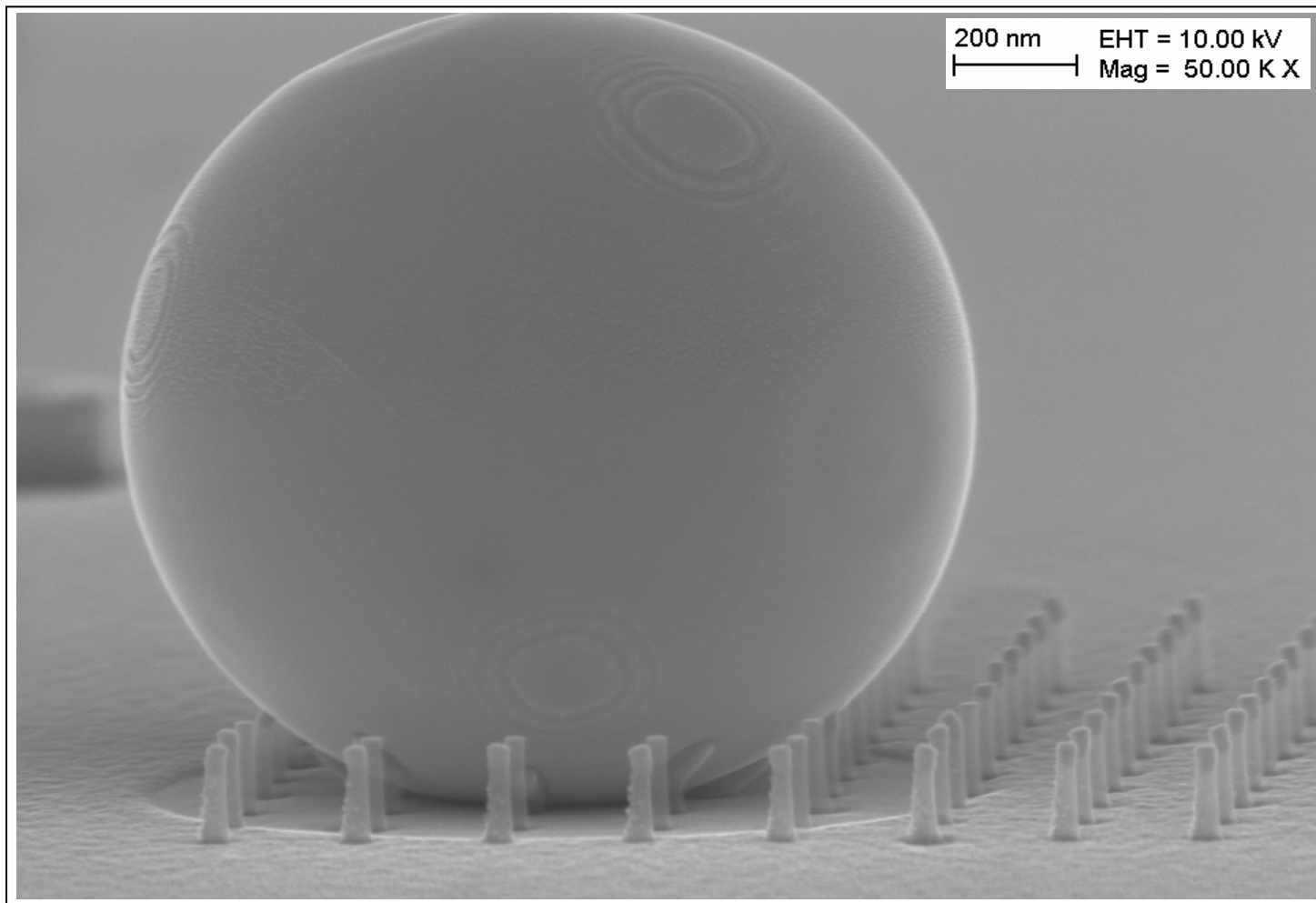


“Meteorite in nano-world”

Description:

Vertical PtSi/Si nanowire arrays bombarded by a nano particle.

During the realization of vertical PtSi/Si nanowire arrays, a unknown particle with a $1.4\mu\text{m}$ diameter, is fell down the array just before the anisotropic platinum deposit, by creating a shadow area.



Magnification: **50.00 KX**

Submitted by: **Xiang-Lei HAN**

Instrument: **ZEISS ULTRA 55 SEM**

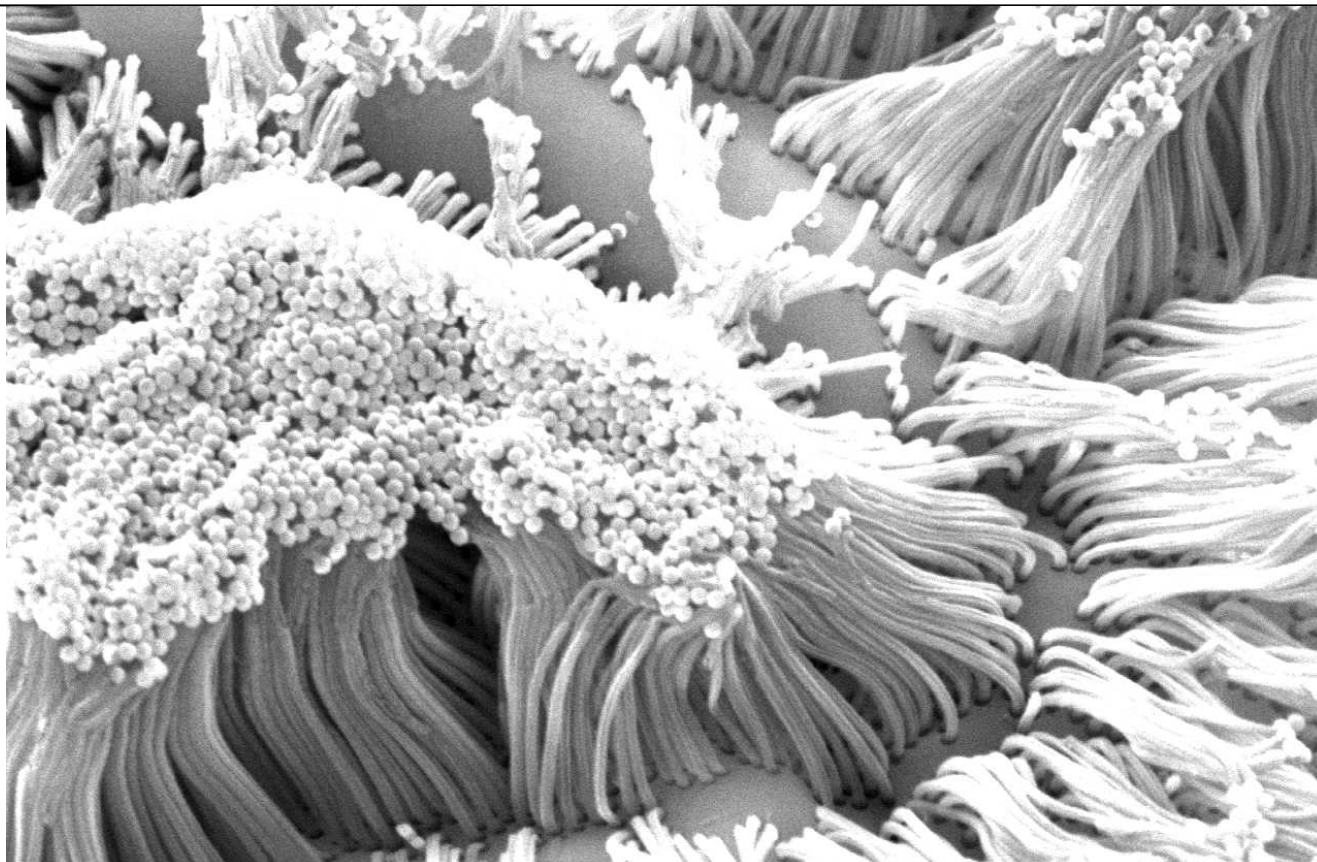
Affiliation: **IEMN-CNRS, Villeneuve d'Ascq, France**



micro & nano - graph Title: The golden needle mushroom

Description:

The silicon nanowires (SiNW) was formed by nanobead lithography and catalytic etching, the too long SiNW became curved.



20kV

X10,000

1 μm

NTNU

Magnification: Scale on the picture

Submitted by: Mao-Jung Huang

Chii-Rong yang

Instrument: JEOL JSM - 6360

Affiliation: ITRC, NARL, Taiwan

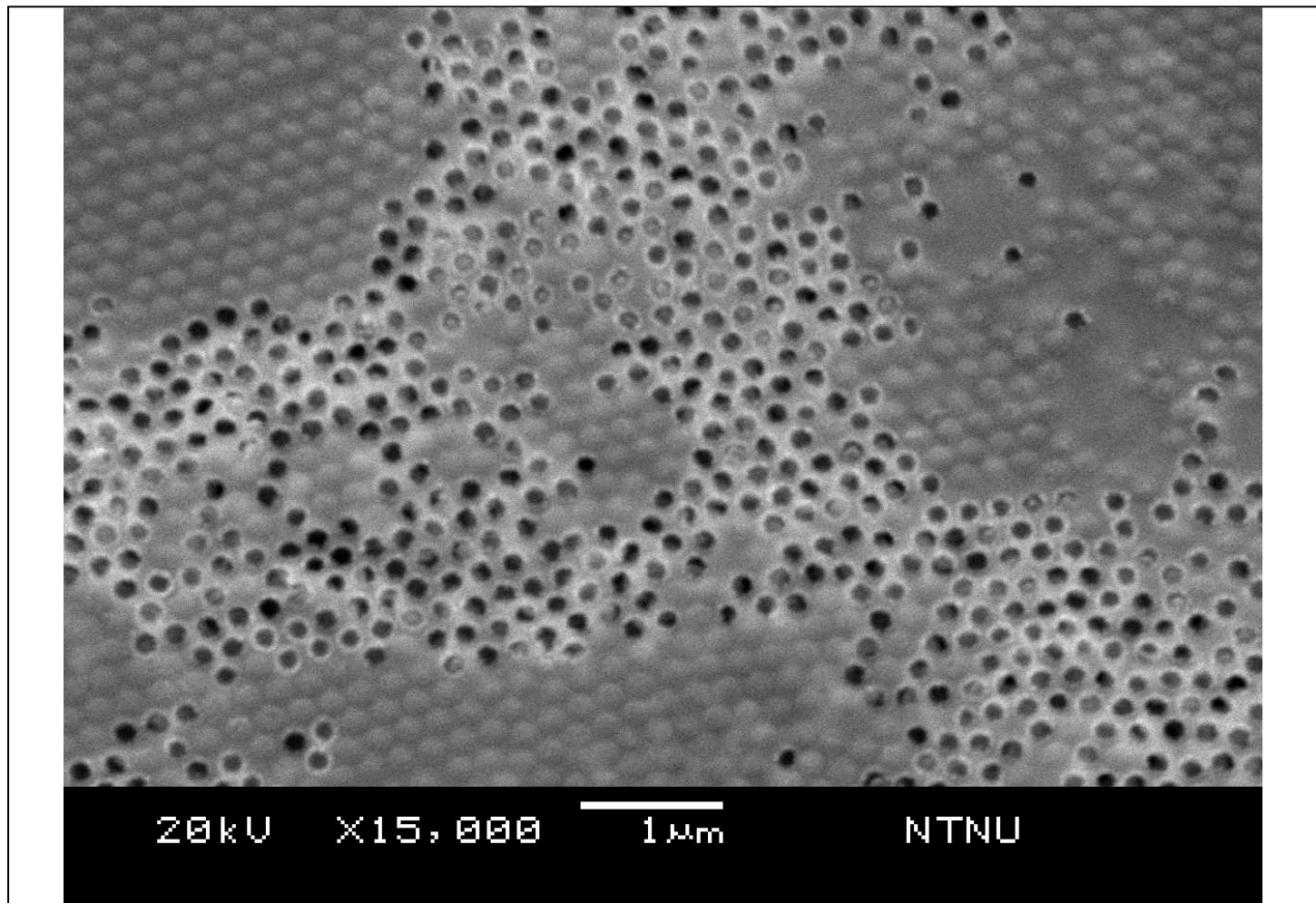
National Taiwan normal university, Taiwan



micro & nano - graph Title: The Beehive

Description:

We wanted to remove the polystyrene bead which was under a silicon nitride film for fabricating the nanohole array, but the lift-off process was not successful completely. The nanohole looked like the hive where the young bee is just hatched.



Magnification: Scale on the picture

Submitted by: Mao-Jung Huang
Chii-Rong yang

Instrument: JEOL JSM - 6360

Affiliation: ITRC, NARL, Taiwan

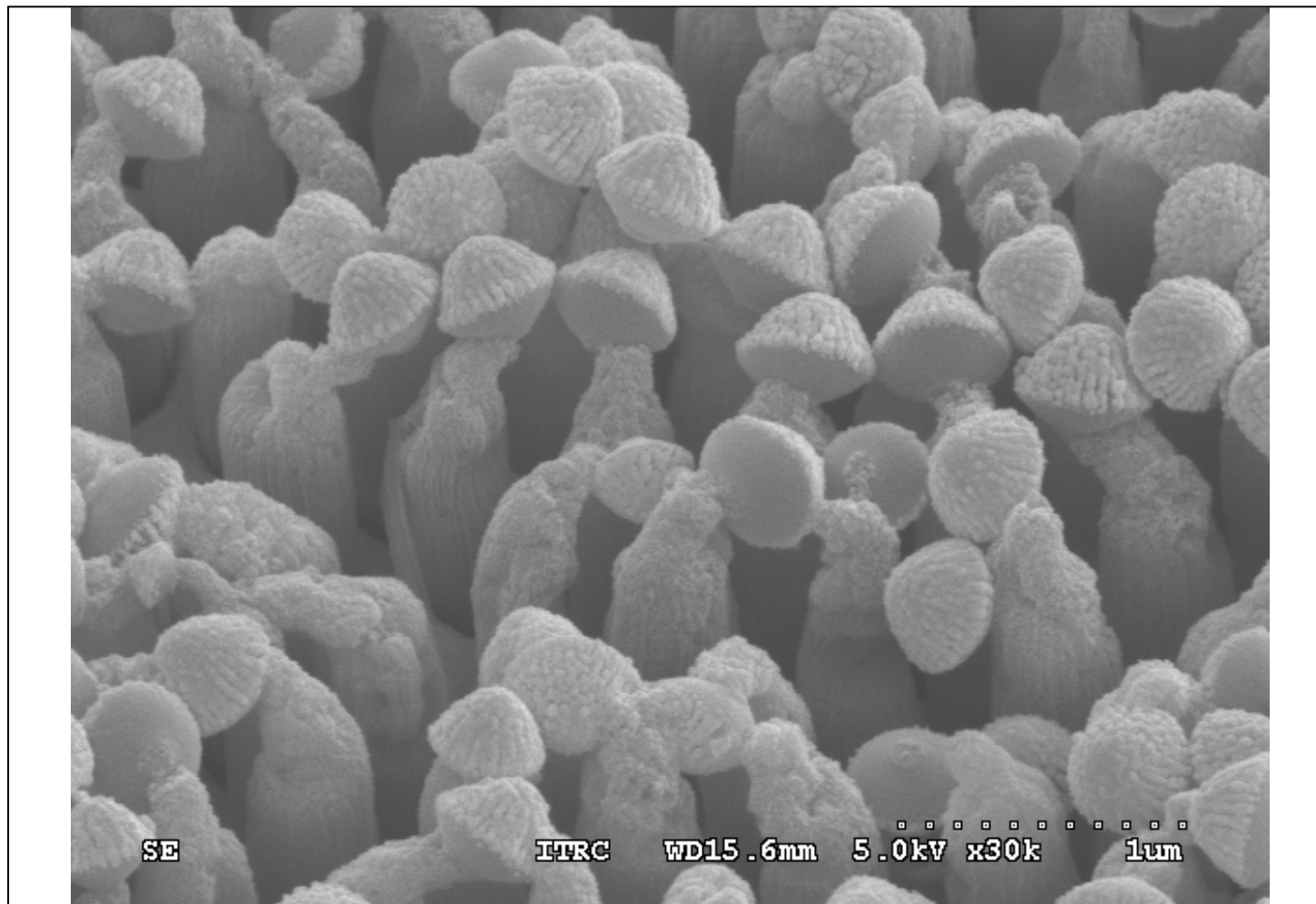
National Taiwan normal university, Taiwan



micro & nano - graph Title: **The mushroom**

Description:

The mushroom-like structure was composited by silicon nanorods and thinned polystyrene beads after catalytic etching.



Magnification: Scale on the picture

Submitted by: Mao-Jung Huang

Chun-Ming Chang, Nien-Nan Chu

Instrument: Hitachi S-4300

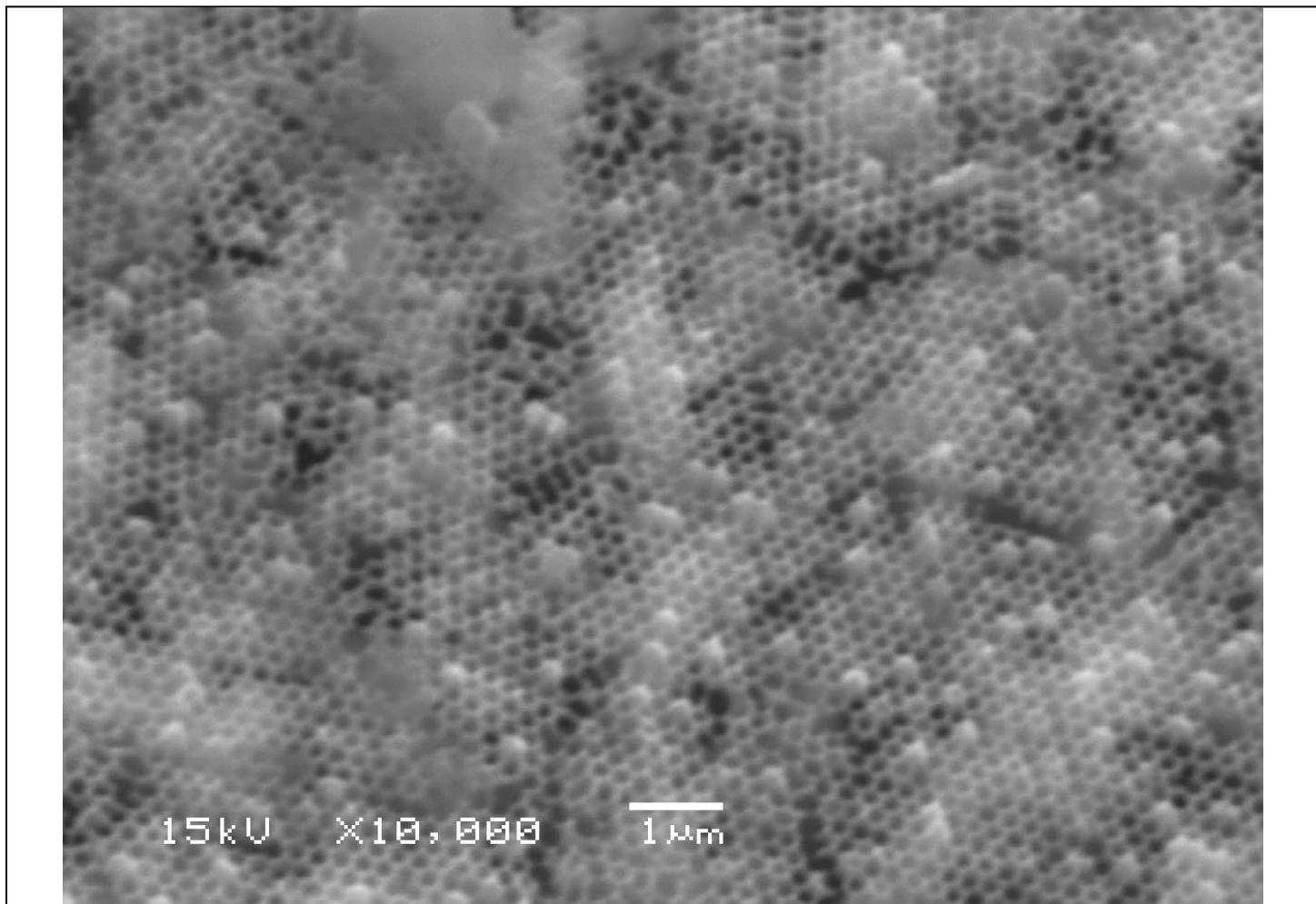
Affiliation: ITRC, NARL, Taiwan



micro & nano - graph Title: **Honeycomb**

Description:

The silicon nitride film with nanohole array was fabricated by nanobead lithography and RIE etching. The remained nanobeads on the porous nitride film looked like bee pupae.



Magnification: Scale on the picture

Submitted by: Mao-Jung Huang
Chii-Rong yang

Instrument: JOEL JSM - 6360

Affiliation: ITRC, NARL, Taiwan

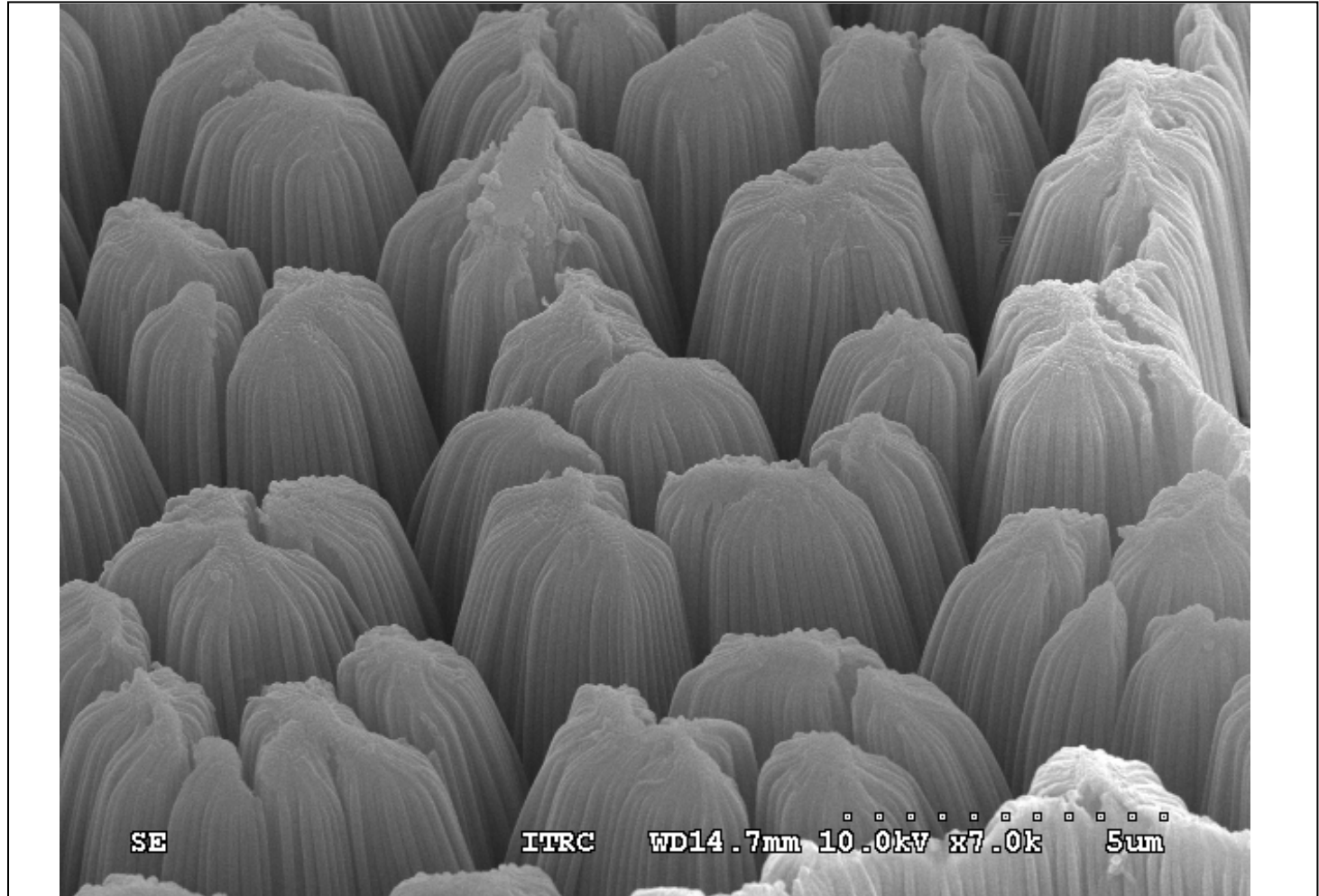
National Taiwan normal university, Taiwan



micro & nano - graph Title: Fountain

Description:

The structure was formed by nanobead lithography and catalytic etching. The pleated side wall of structures was due to double layer nanobead template.



Magnification: Scale on the picture

Submitted by: Mao-Jung Huang
Nien-Nan Chu

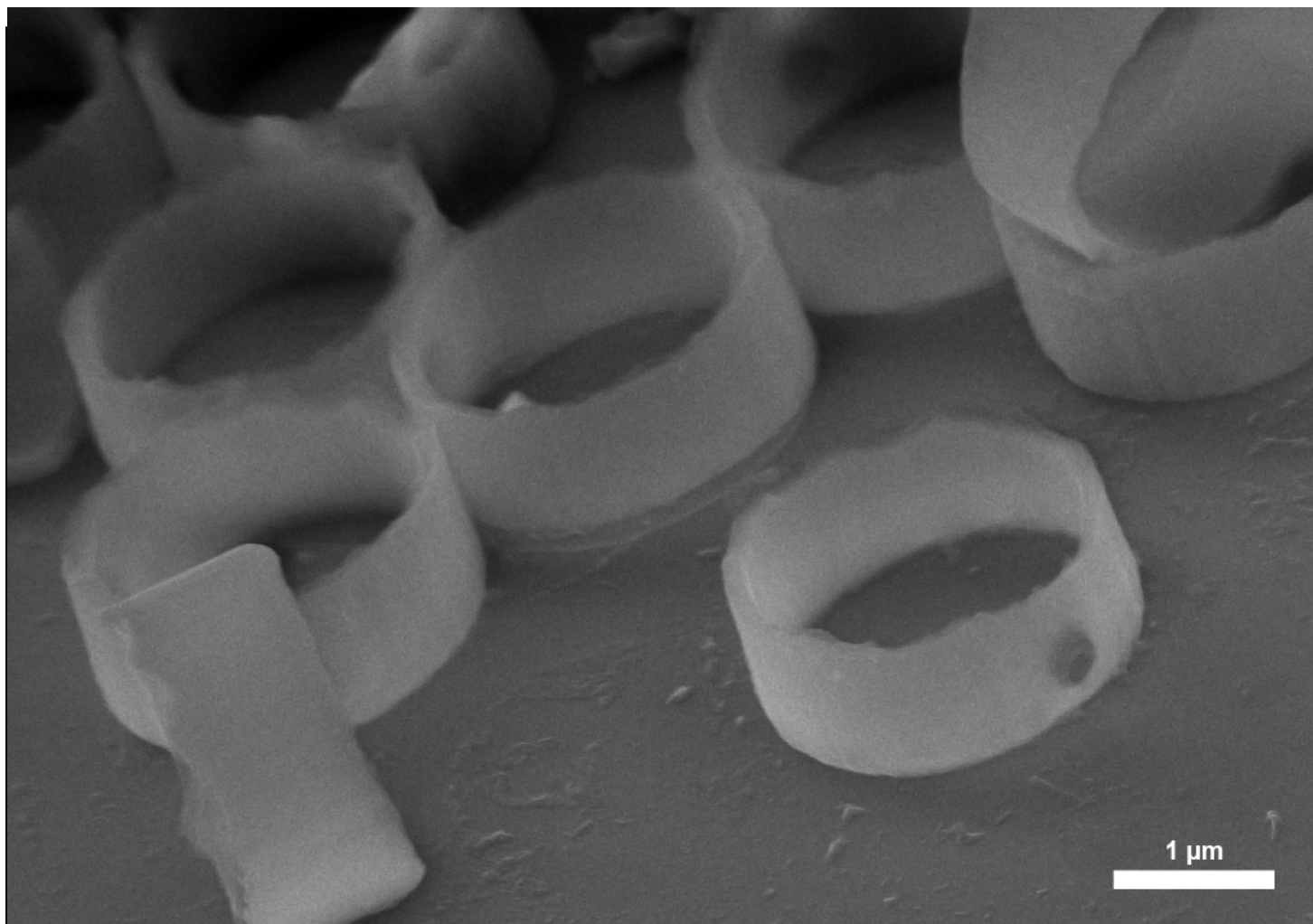
Instrument: Hitachi S-4300

Affiliation: ITRC, NARL, Taiwan



Description:

These are Nano-wedding rings!
They shall remind every career-focused, workaholic researcher NOT to forget her/his PRIVATE LIFE!
There are other humans out there.
Go, meet them!



Magnification: Scale on the image

Submitted by: Stefan Kalchmair

Instrument: Raith e-Line

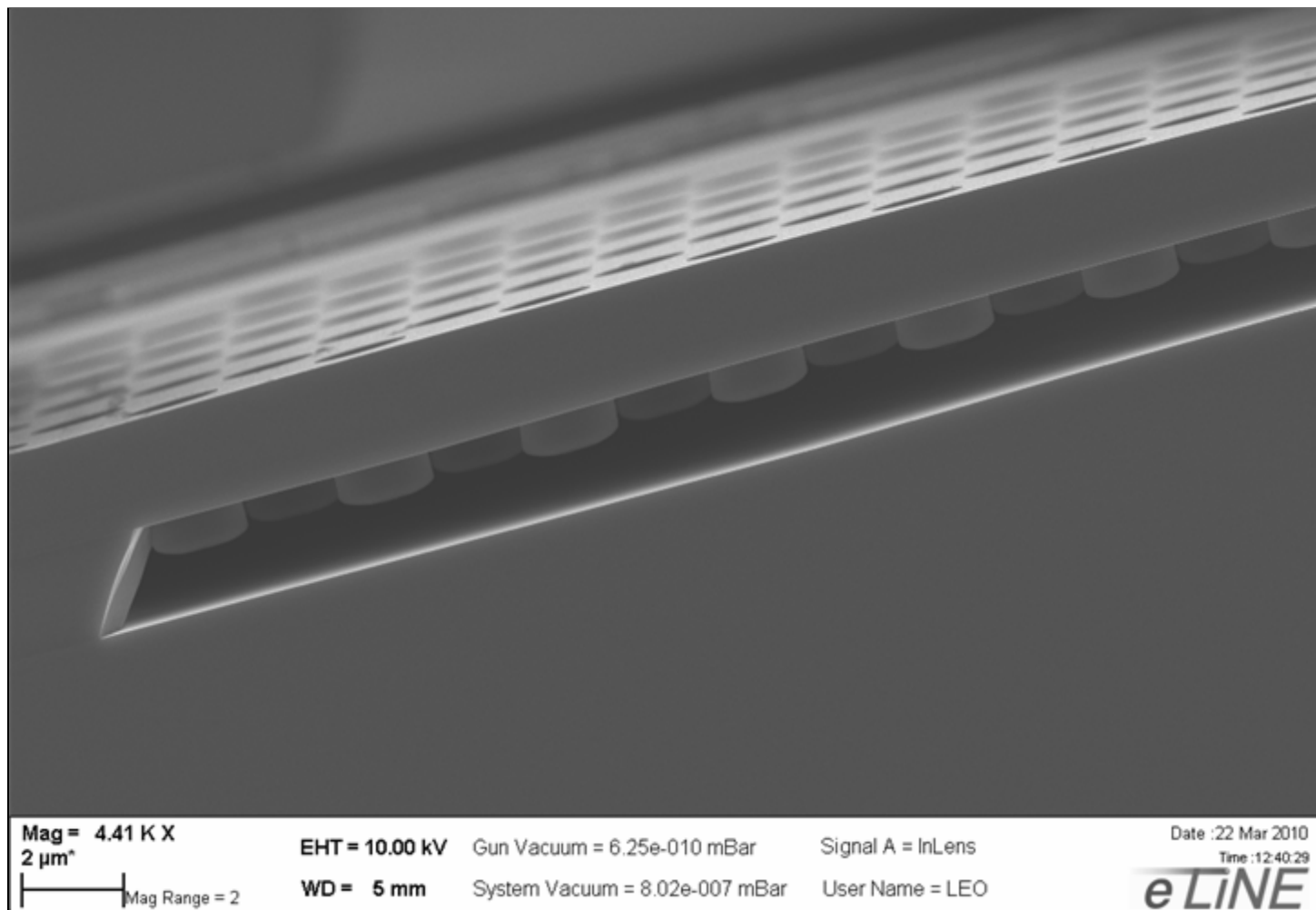
Affiliation: Vienna University of Technology,
Vienna, Austria



micro & nano - graph Title: “Nano Super-Mario-Land”

Description:

The dream of everyone, who ever played Super-Mario-Land. Millions of equal tiny pipes to jump in and discover new worlds on the other side.



Magnification: Scale on the image

Submitted by: Stefan Kalchmair

Instrument: Raith e-Line

Affiliation: Vienna University of Technology,
Vienna, Austria

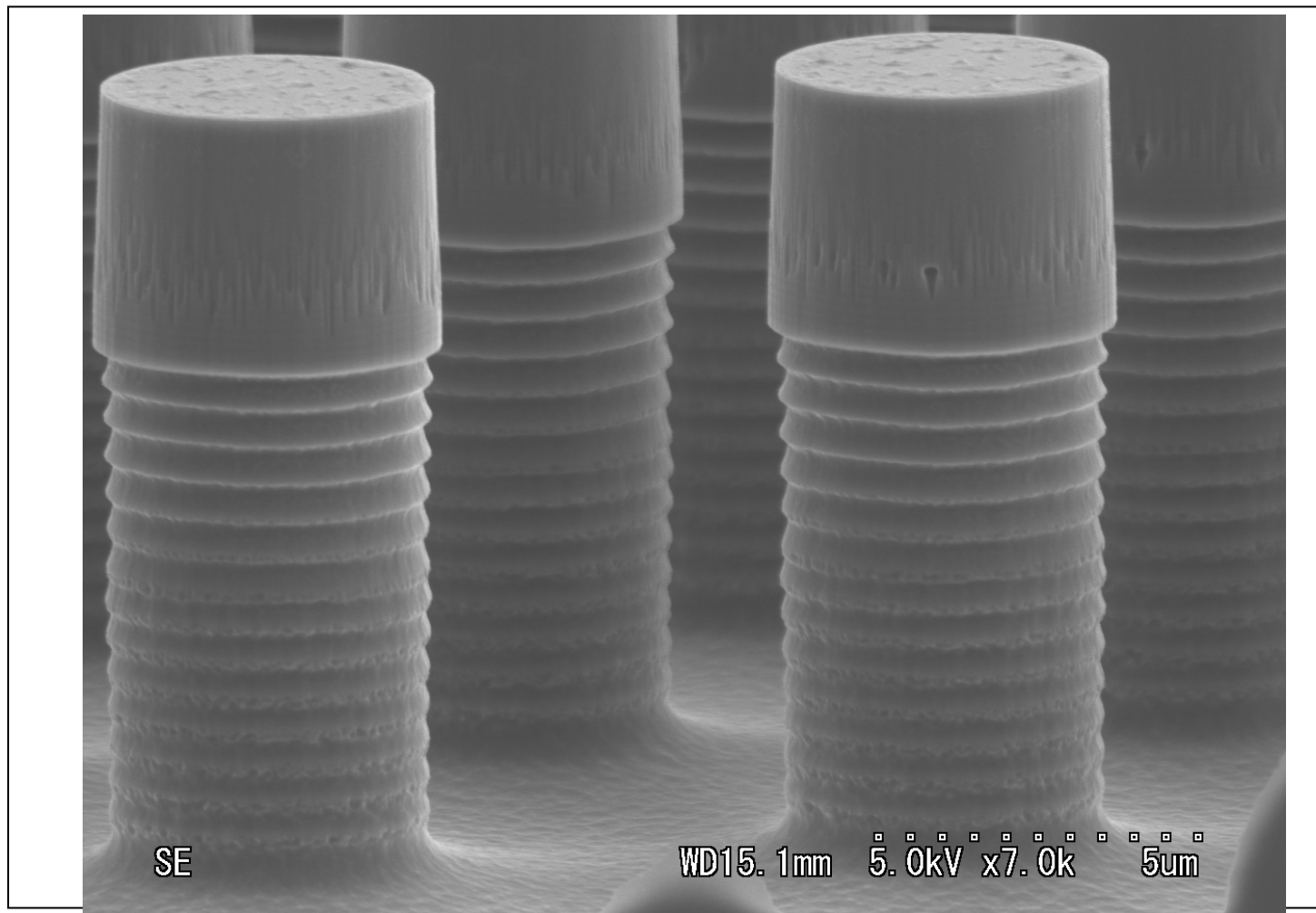


“Pick a title that the judges will change”

Description:

Micron size screws.

It is obtained that silicon deep etching by Bosch process. First, silicon is etched by short step time process in order to suppress scalloping and next, done by relatively large step time to obtain clear scalloping pattern.



Magnification: 7KX

Submitted by: Hiroaki Kawata

Instrument: Hitachi FESEM, S-4300

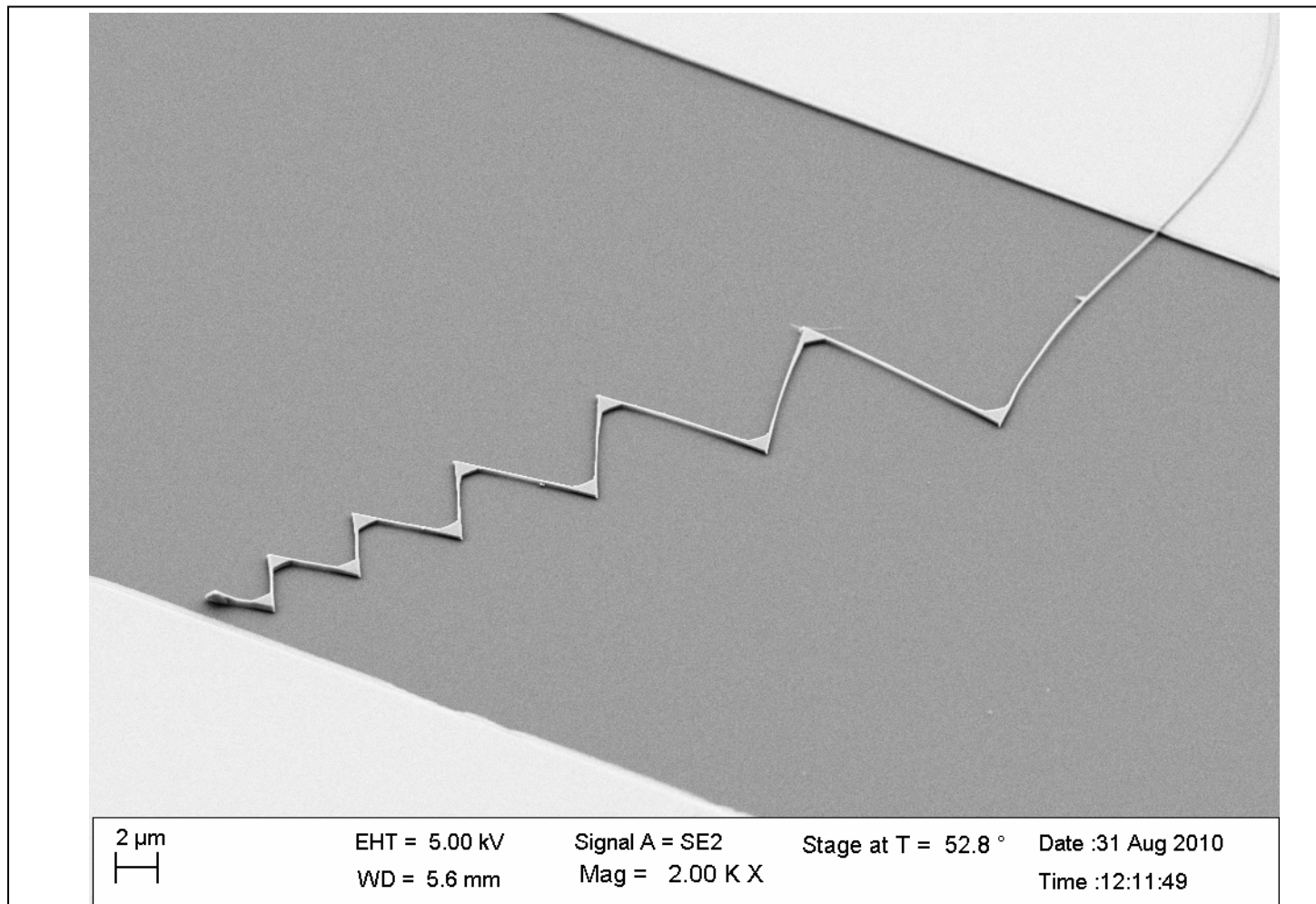
Affiliation: Osaka Prefecture Univ.,
Sakai, Osaka, Japan



micro & nano - graph Title: “Trapped Zig Zag Snake”

Description:

The growth of our tin oxide nanowires (NWs) occurs along two preferred growth directions. While most NWs grow along one direction, some NWs show alternating growth and the result is a zig-zag shaped NW. For the realization of a highly sensitive NW gas sensor, this NW was transferred to a Si-substrate and evaporated on both ends with Ti-Au-contacts. However, only the NW's tail was hit by the metal pad.



Magnification: 2.00 KX

Instrument: Zeiss Ultra 40

Submitted by: Anton Koeck, Elise Brunet, Stephan Steinhauer

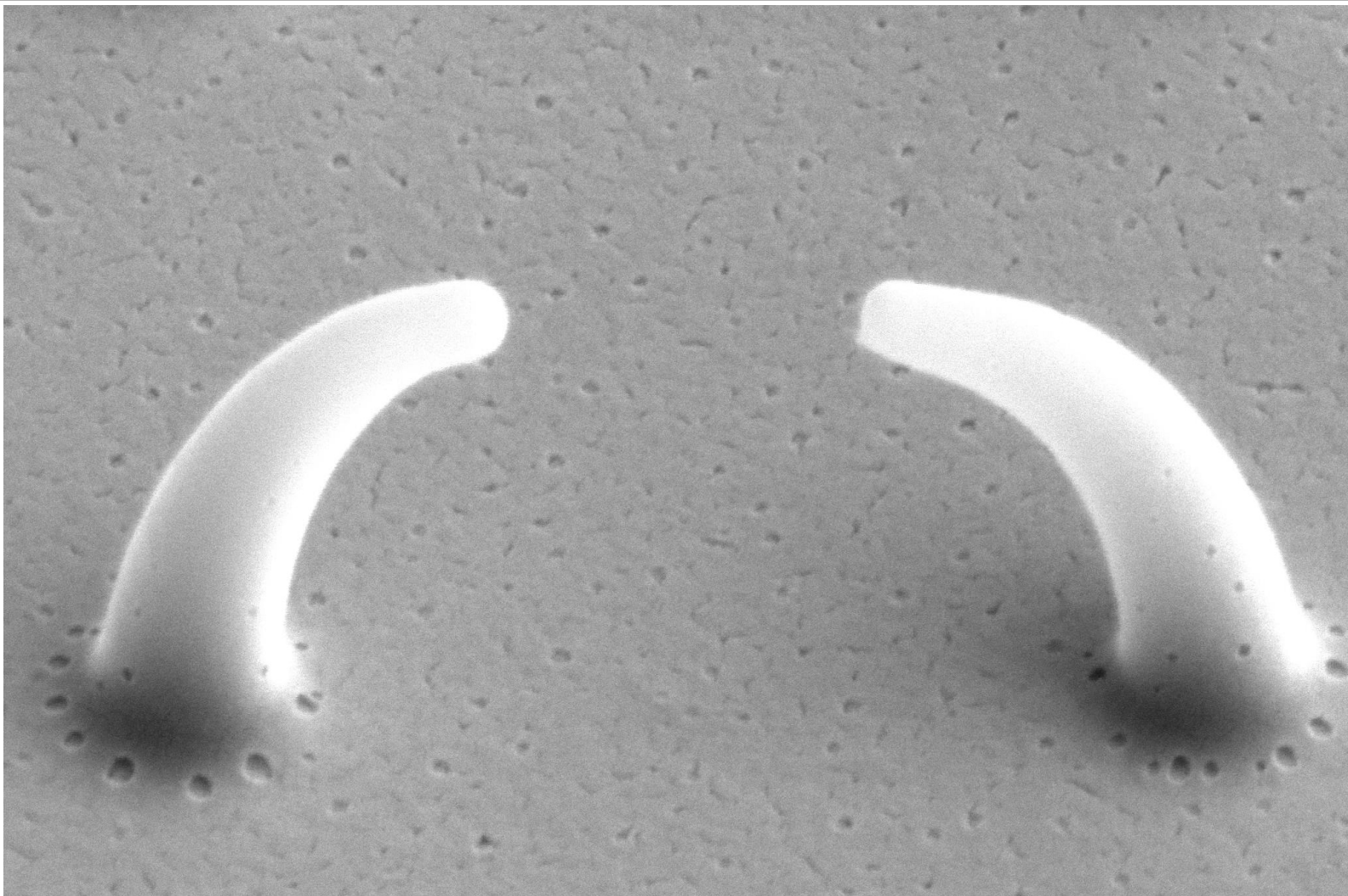
Affiliation: AIT Austrian Institute of Technology, Health & Environment Department, Nano Systems

**Description:**

SAL nano-cones obtained by direct electron-beam lithography.

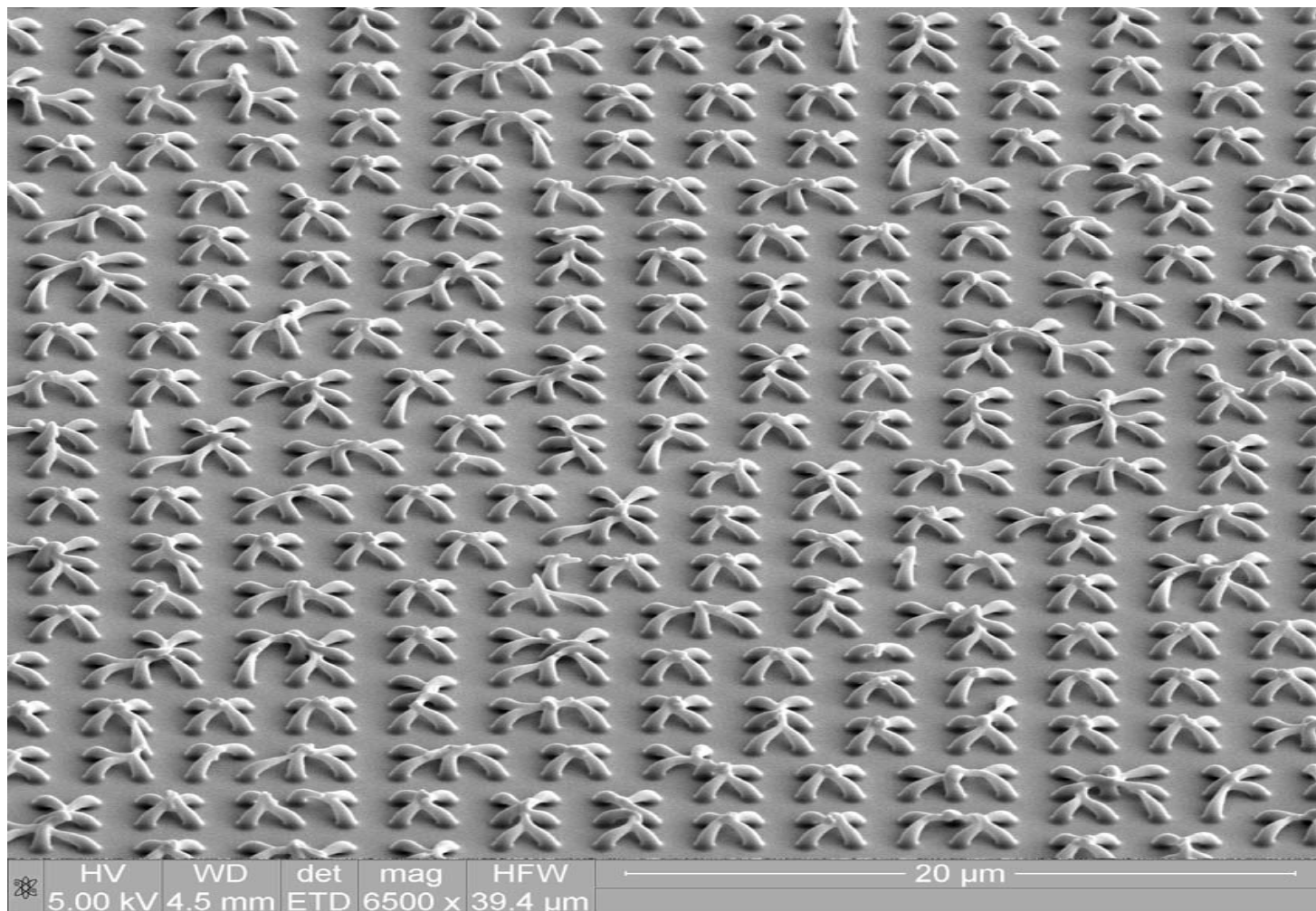
The development was too short, so...we have this incomplete micro-bridge....

Could you complete the building?!

**Magnification: 65 KX****Instrument: FEI NOVA-NANOLAB****Submitted by: FEDERICO MECARINI****Affiliation: - Italian Institute of Technology IIT****- BioNEM Lab @ University of Catanzaro - Italy**

**Description:**

SAL micro-spider
obtained by direct
electron-beam
lithography.
The development
was really short...
....it wasn't enough
to stop the
invasion!!!



Magnification: 6,5 KX

Instrument: FEI NOVA-NANOLAB

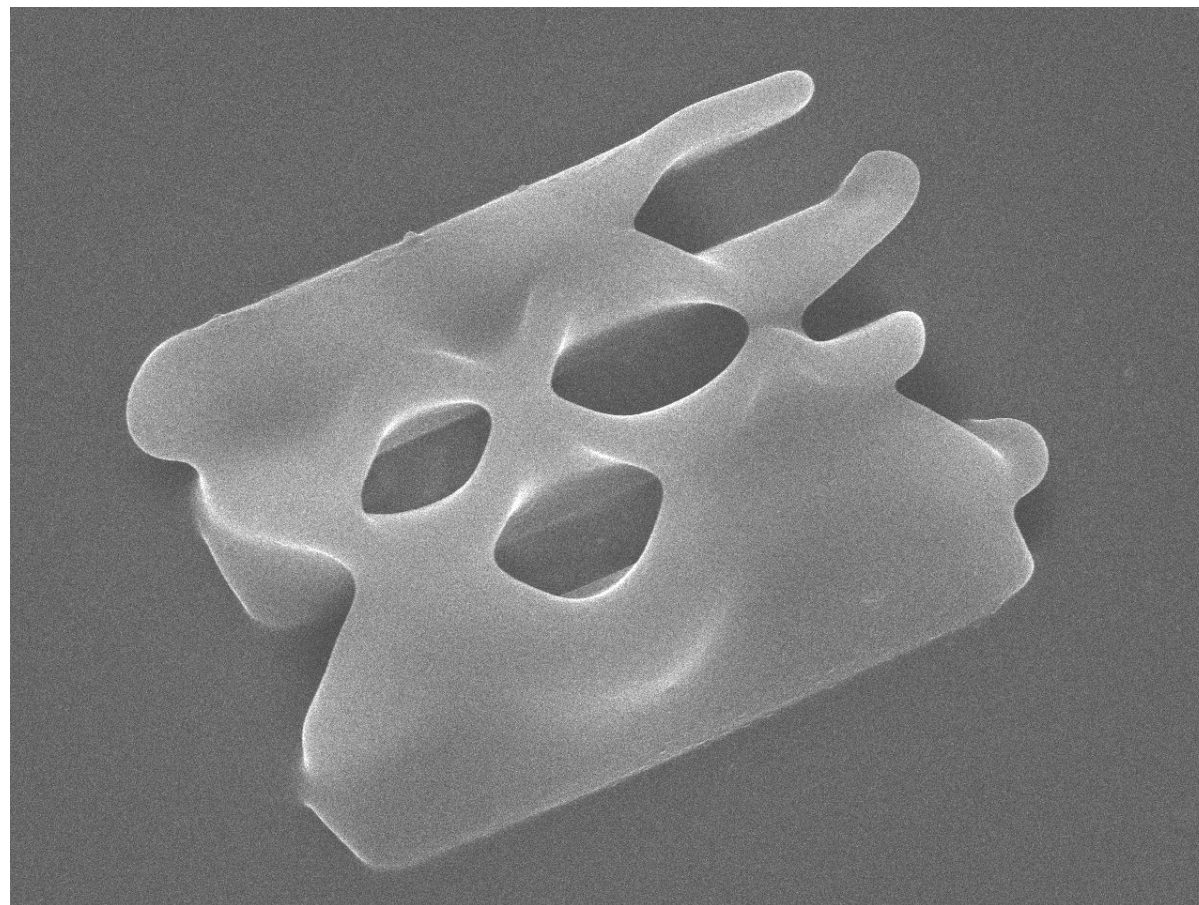
Submitted by: FEDERICO MECARINI

Affiliation: - Italian Institute of Technology IIT

- BioNEM Lab @ University of Catanzaro - Italy

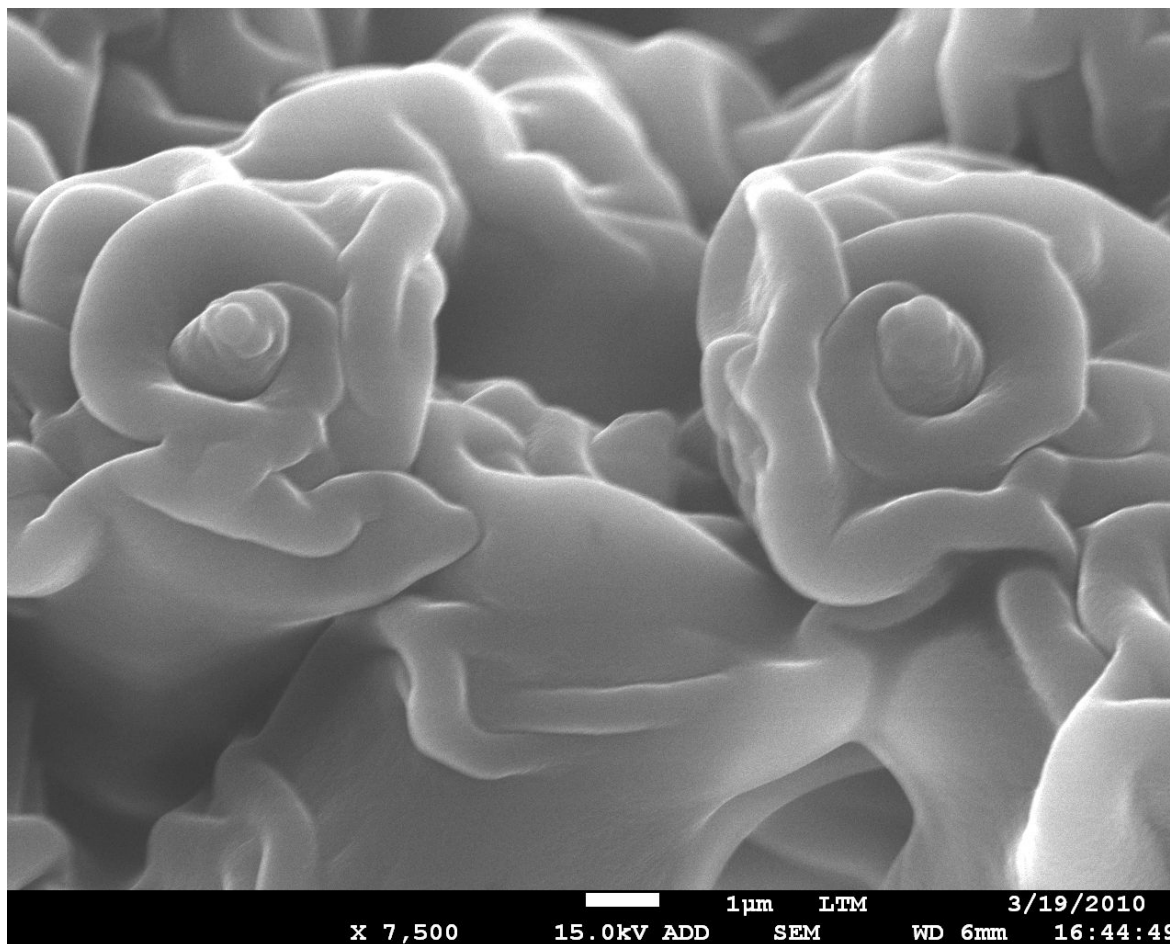
**Description:**

- Pattern obtain by 2-photon polymerization of Poly-Ethylene-Glycol (PEG).
- Overexposition of a $1\mu\text{m}$ line $2\mu\text{m}$ pitch lattice.

**Magnification:** 3.6 k X**Instrument:** Zeiss Ultra PLus**Submitted by:** Thibault Honegger**Affiliation:** BioColloNa - LTM-CNRS – UJF - CEA - Minatec

**Description:**

Pattern obtained by 2-photon polymerization (TPP) of Poly-Ethylene-Glycol (PEG). Overexposition and resist flow during TPP create this pattern.

**Magnification: 7.5 k X****Instrument: Zeiss Ultra PLus****Submitted by: Thibault Honegger****Affiliation: BioColloNa - LTM-CNRS – UJF - CEA - Minatec**

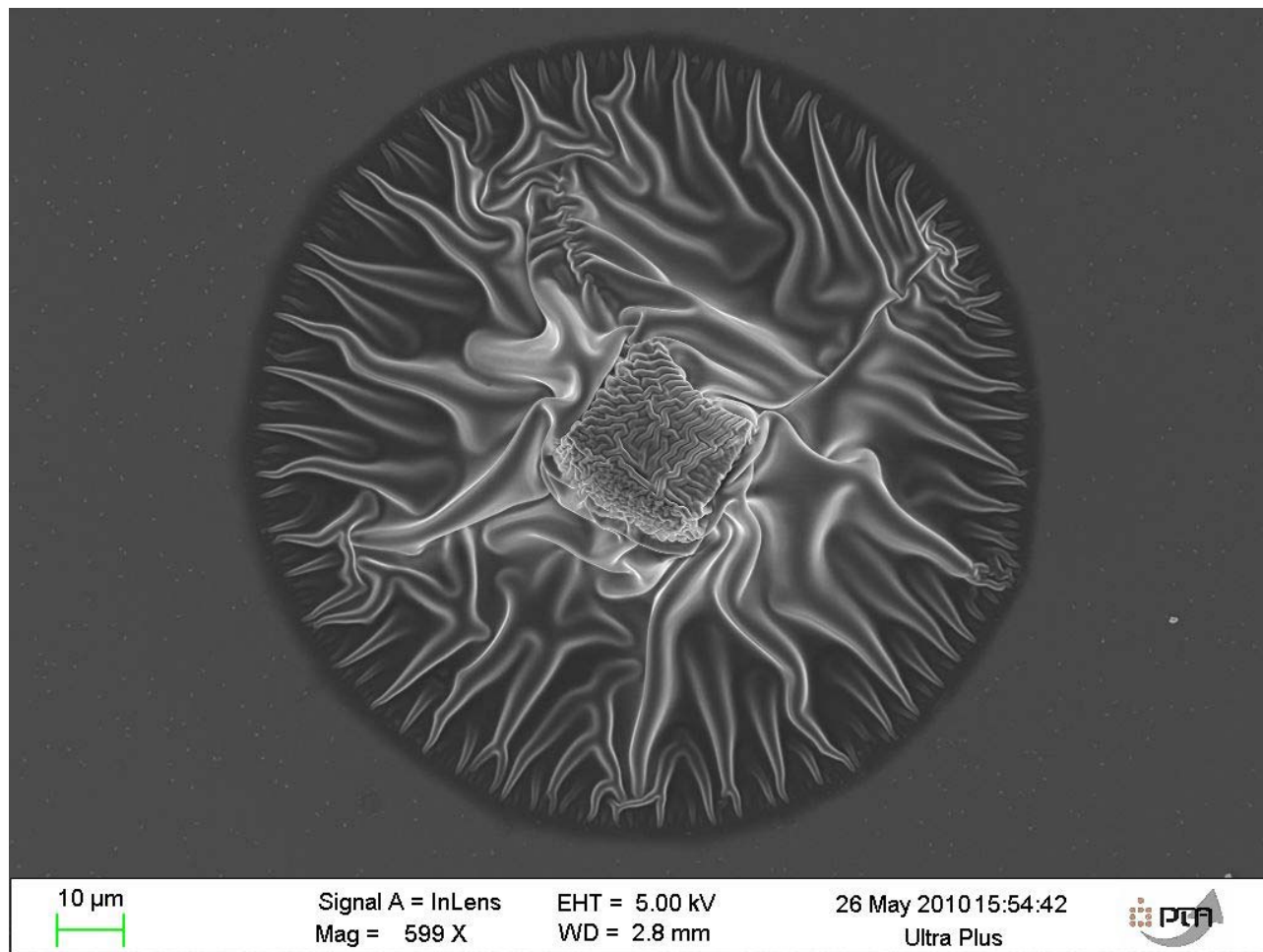


micro & nano - graph Title:
“Satanic balet”
“Diavolo Balletto”

Description:

Pattern obtained by 2-photon polymerization (TPP) of Poly-Ethylene-Glycol (PEG)

The aim of the experiment was to create a 20 μm cube (picture center) but resist polymerized all through the droplet due to overexposition.



Magnification: **559 X**

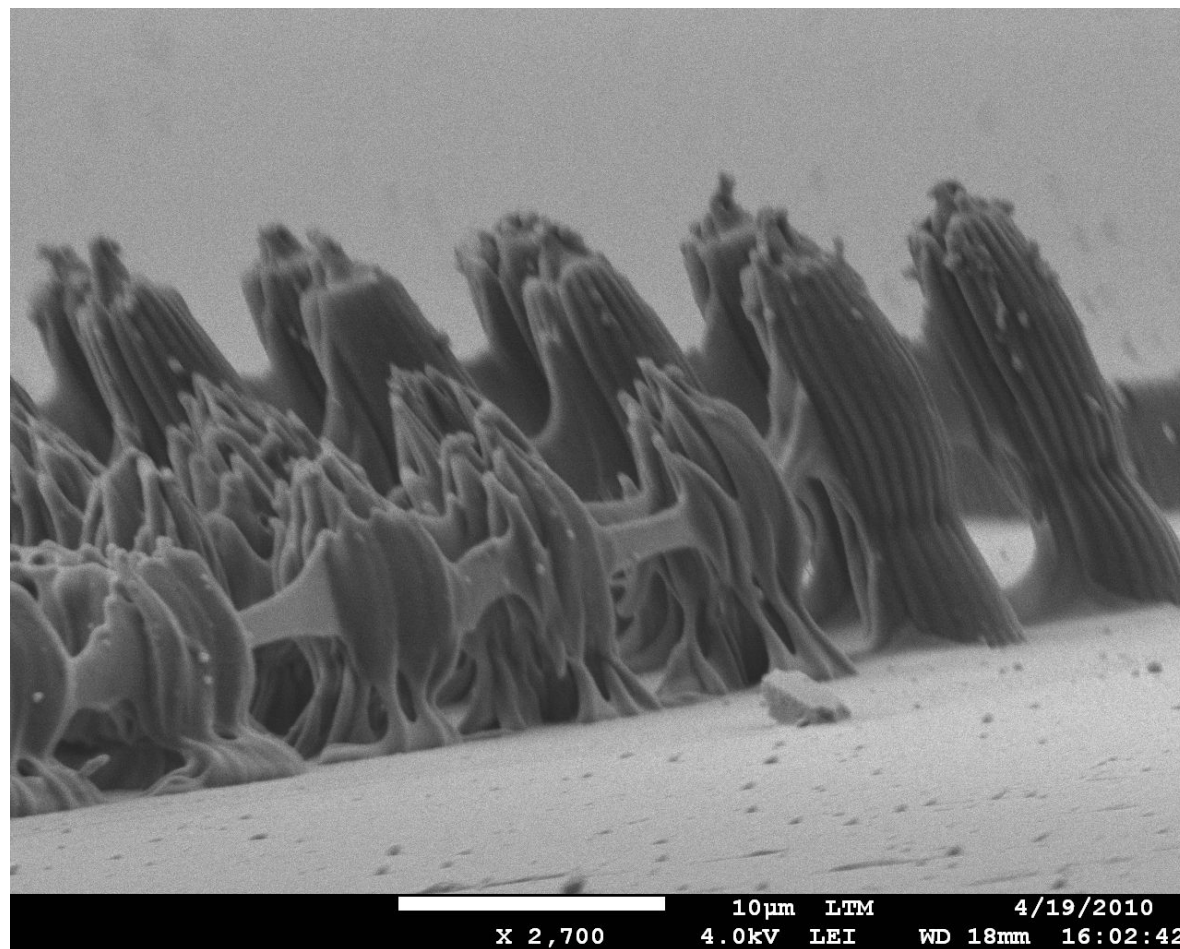
Submitted by: **Thibault Honegger**

Instrument: **Zeiss Ultra Plus**

Affiliation: **BioCollona - LTM-CNRS – UJF – CEA - Minatec**

**Description:**

2-photon
polymerization
(TPP) of Poly-
Ethylene-Glycol
(PEG). Exposition
conditions (voxel
size – overlap –
TPP dose) are not
well controled.



10 μm LTM 4/19/2010
X 2,700 4.0kV LEI WD 18mm 16:02:42

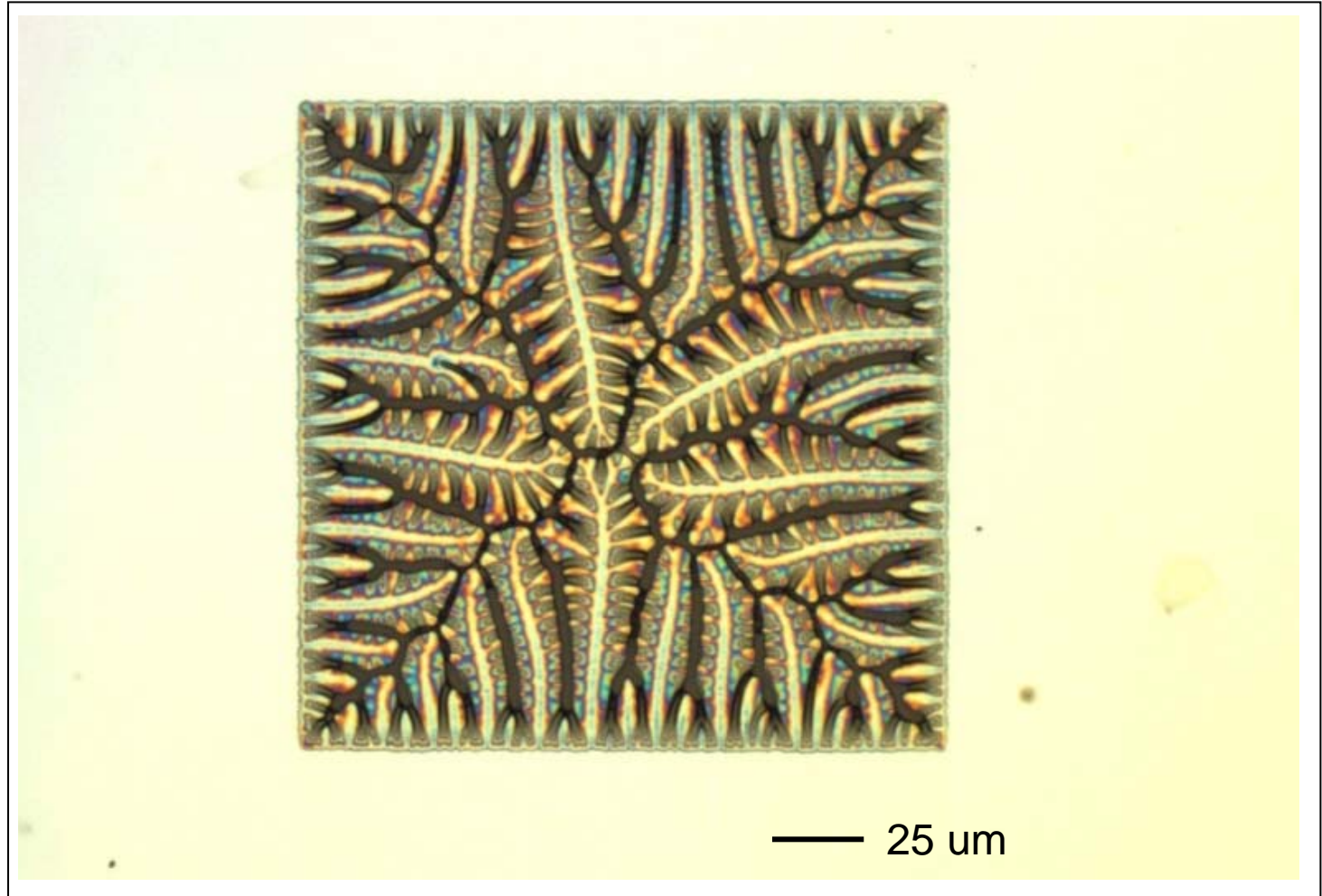
Magnification: 2.7K X**Submitted by:** Thibault Honegger**Instrument:** Zeiss Ultra PLus**Affiliation:** LTM-CNRS, CEA



“Thinking Inside the Box”

Description:

Relief in viscous resist constrained by patterned silane treatment



Magnification: **20x**

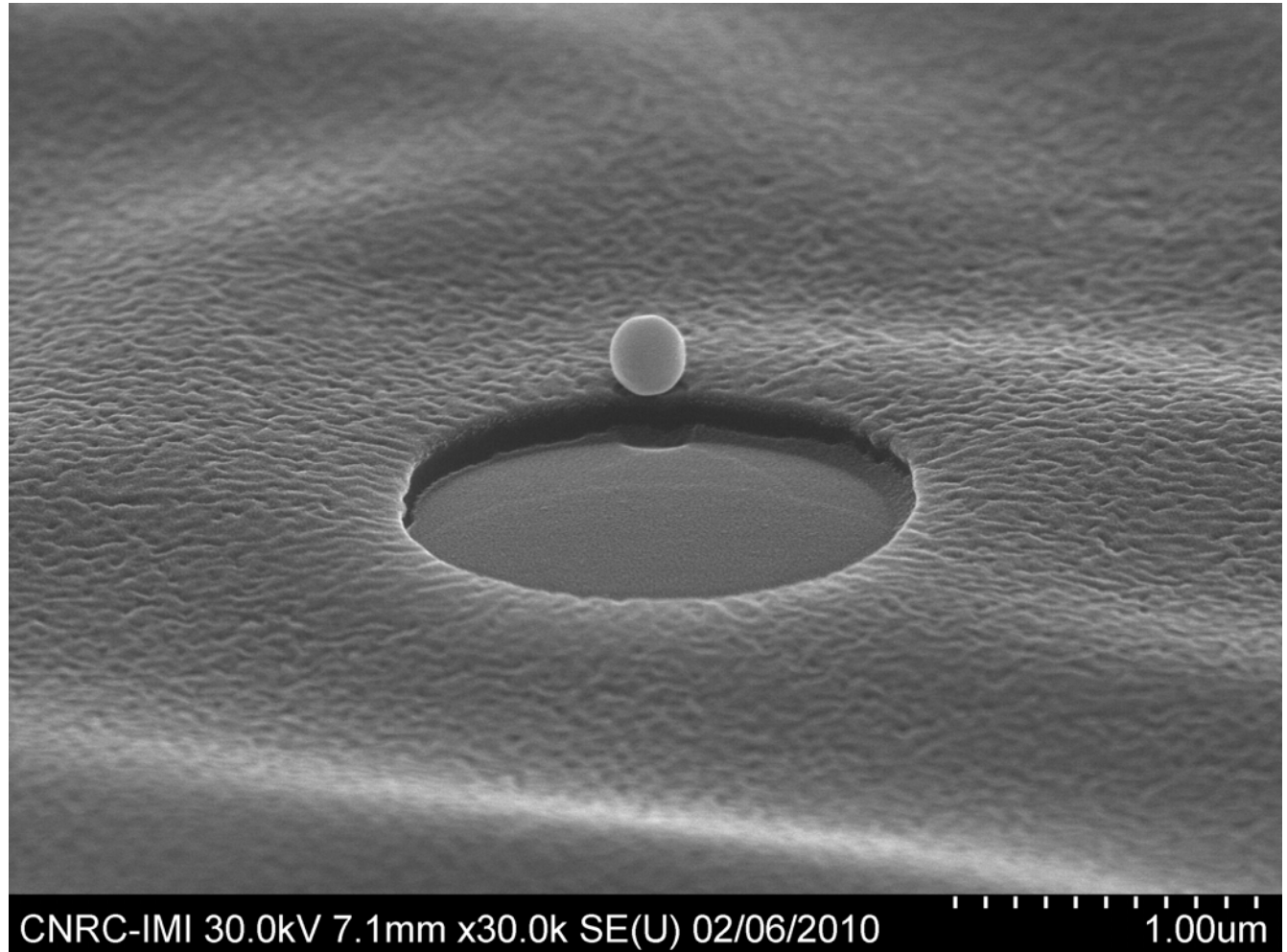
Submitted by: **Keith Morton**

Instrument: **Nikon Eclipse**

Affiliation: **National Research Council Canada**

**“At the Reflection Pool”****Description:**

Gold nanoparticle contamination on an evaporated gold film and buckled nanoimprint resist.



Magnification: 30 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

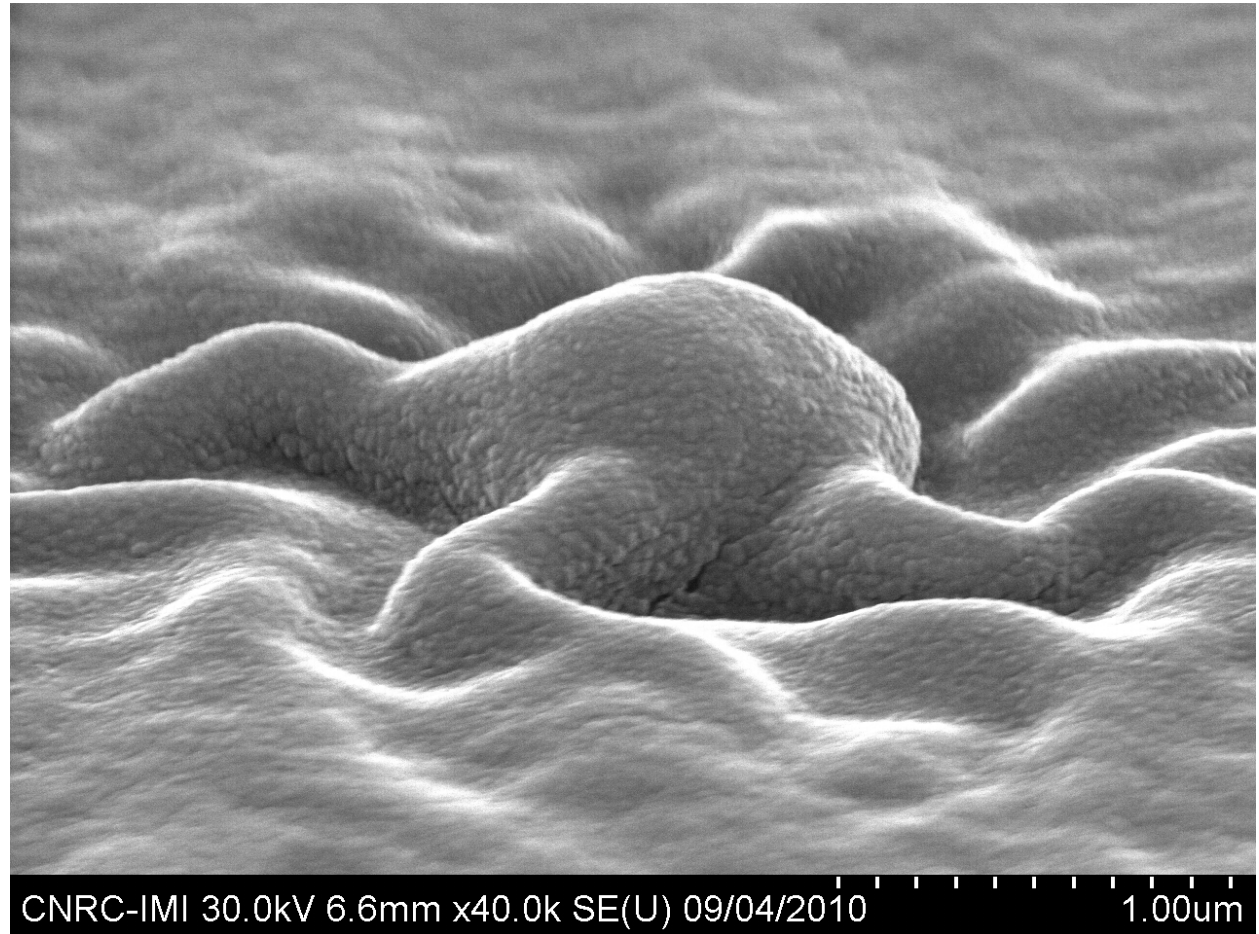
Affiliation: National Research Council Canada



“Monster of the Deep”

Description:

Strange Buckling in
nanoimprint resist



Magnification: 40 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

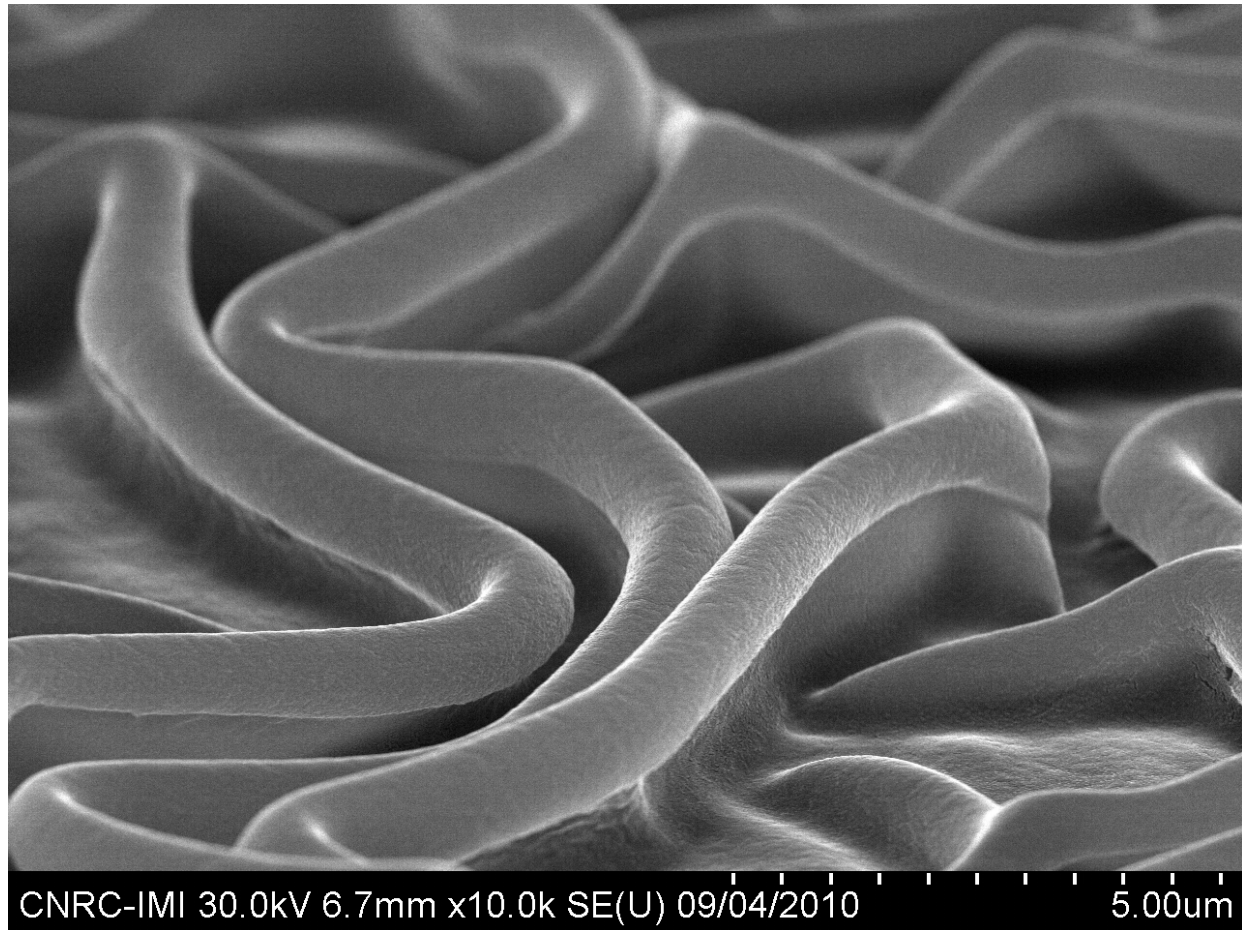
Affiliation: National Research Council Canada



“Curvy”

Description:

Stress relief in heated polymer thin film



Magnification: 10 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

Affiliation: National Research Council Canada



“Flower Power”

Description:

Self-assembled
silver dendrites



Magnification: 30 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

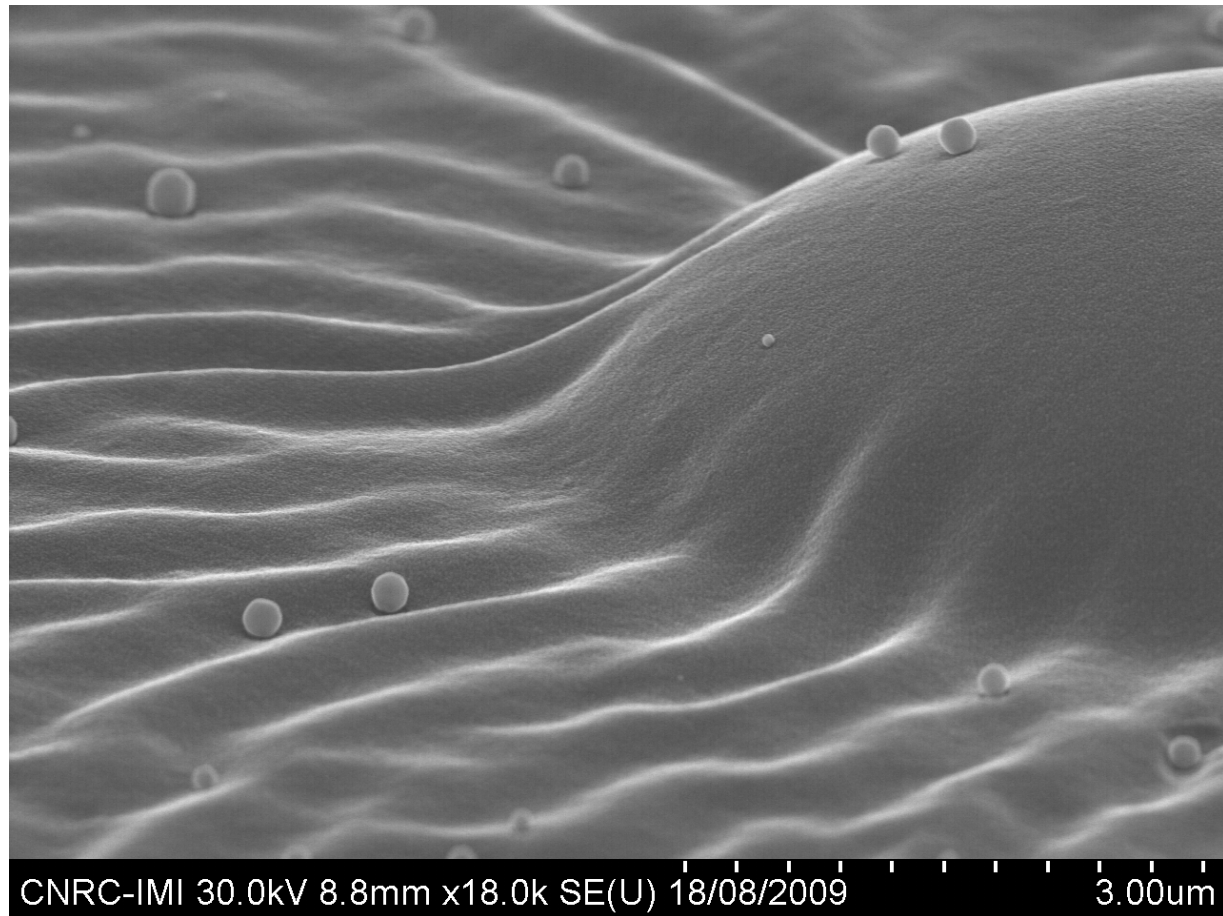
Affiliation: National Research Council Canada



“Rolling Downhill”

Description:

Gold nanoparticles on nanoimprint resist buckling.



Magnification: 30 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

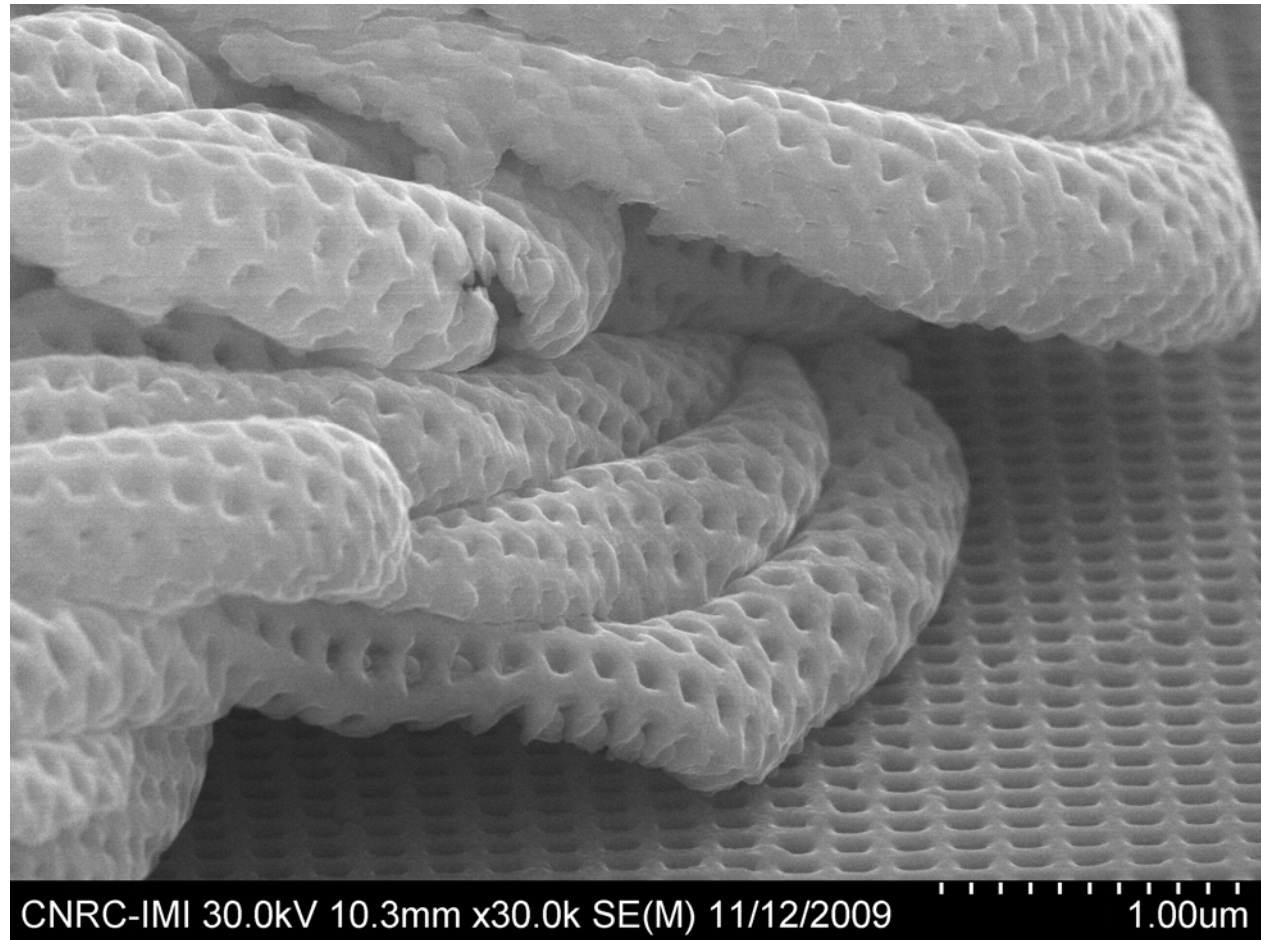
Affiliation: National Research Council Canada



“A wrinkle in time”

Description:

Wrinkling in a
patterned gold film



Magnification: 30 KX

Submitted by: Keith Morton

Instrument: Hitachi 4800

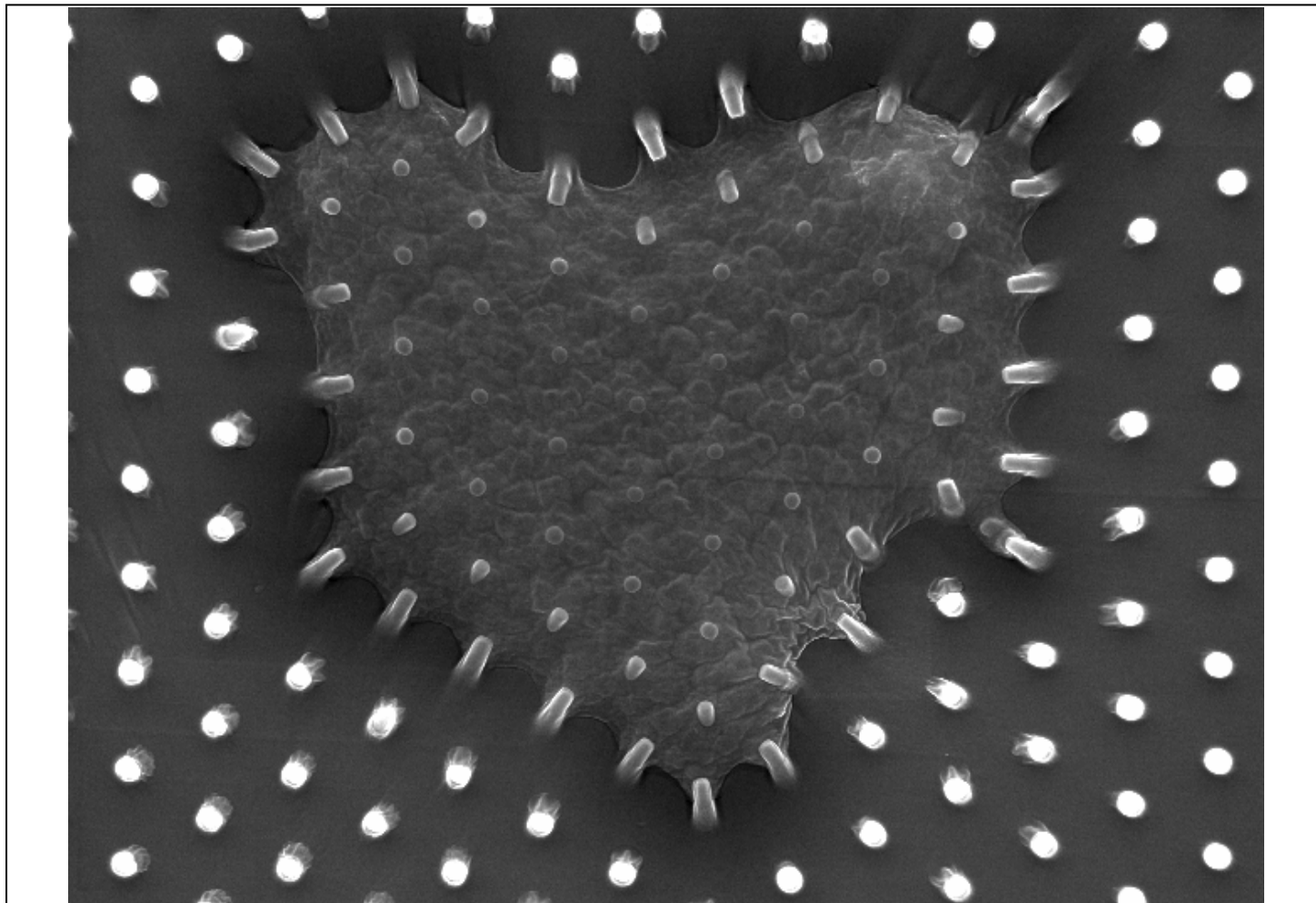
Affiliation: National Research Council Canada

**Description:**

A cluster of bacteria adheres to an elastomeric surface pre-structured with pillars of 1 μm diameter.

The cluster shape nicely represents the bacterias' main activity prior to vacuum drying:

Happy reproducing...



Magnification: 2500X

Submitted by: Peter Nill

Instrument: Philips XL 30

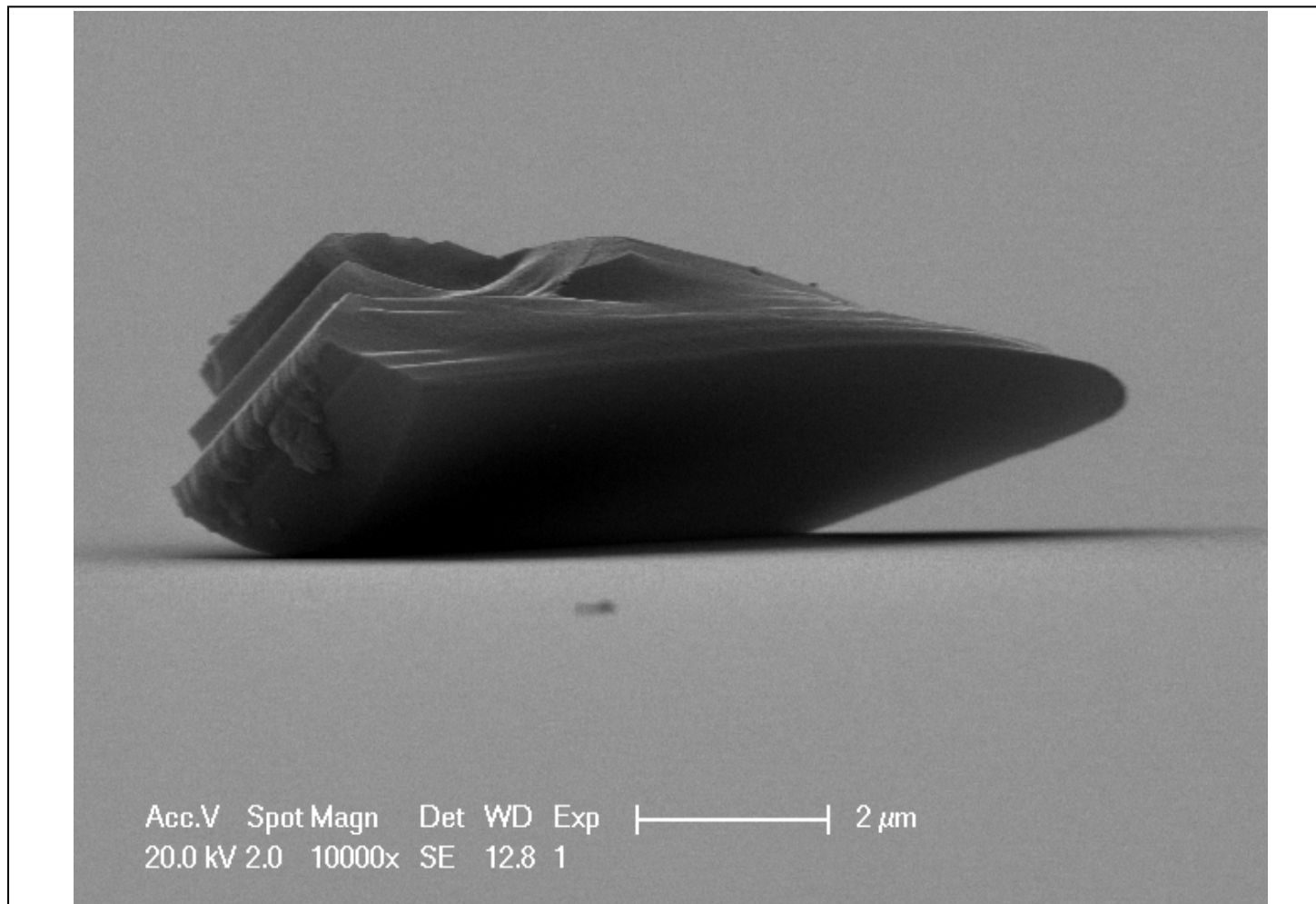
Affiliation: Institute of Applied Physics,
Eberhard-Karls-Universität Tübingen, Germany

**Description:**

A silicon particle on a (otherwise perfectly clean) piece of silicon.

Nice little yacht!

Currently, we're trying to up-scale the process...



Magnification: 10000X

Submitted by: Peter Nill

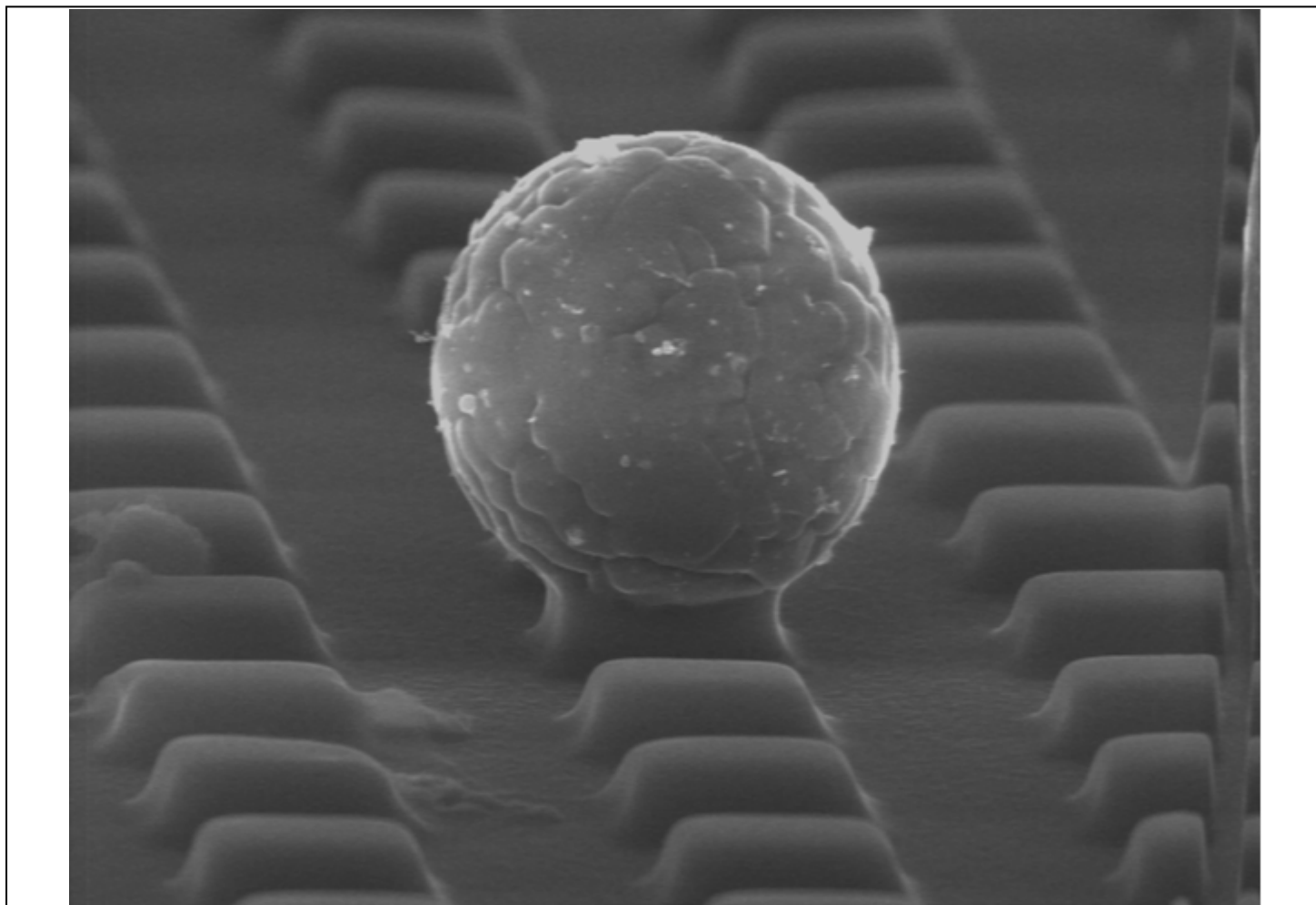
Instrument: Philips XL 30

Affiliation: Institute of Applied Physics,
Eberhard-Karls-Universität Tübingen, Germany

**Description:**

A ball of unknown particles on a lithographically patterned elastomer surface.

Of course, we all knew before, that nanotechnology has got brains...

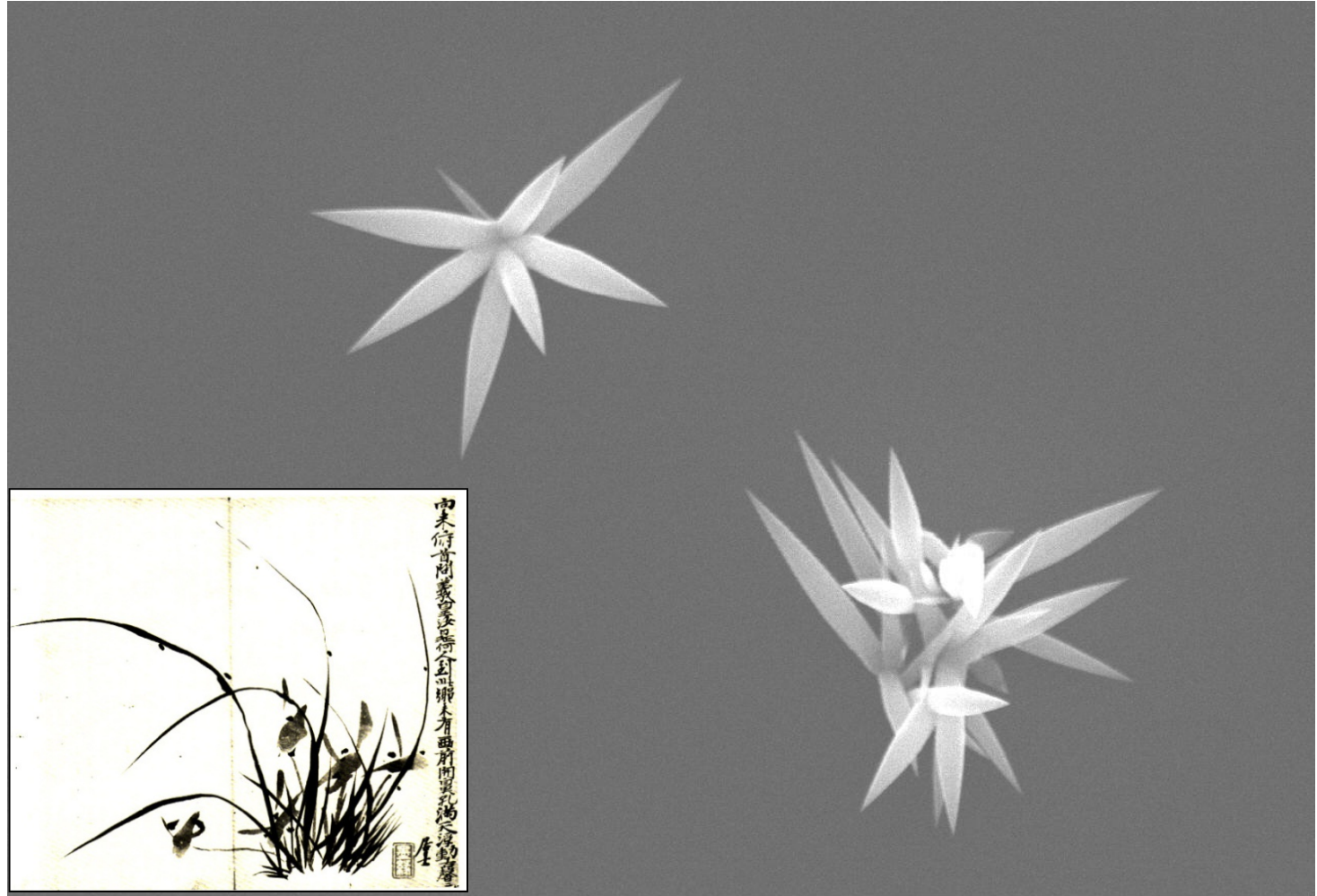
**Magnification: 6500X****Submitted by: Peter Nill****Instrument: Philips XL 30****Affiliation: Institute of Applied Physics,
Eberhard-Karls-Universität Tübingen, Germany**



micro & nano - graph Title:
“The Oriental Orchid”

Description:

The zinc oxide fibers look like the oriental orchid. The smooth curve of ZnO orchid shows beauty of orient



Magnification: 10KX

Submitted by: Sang Han Park

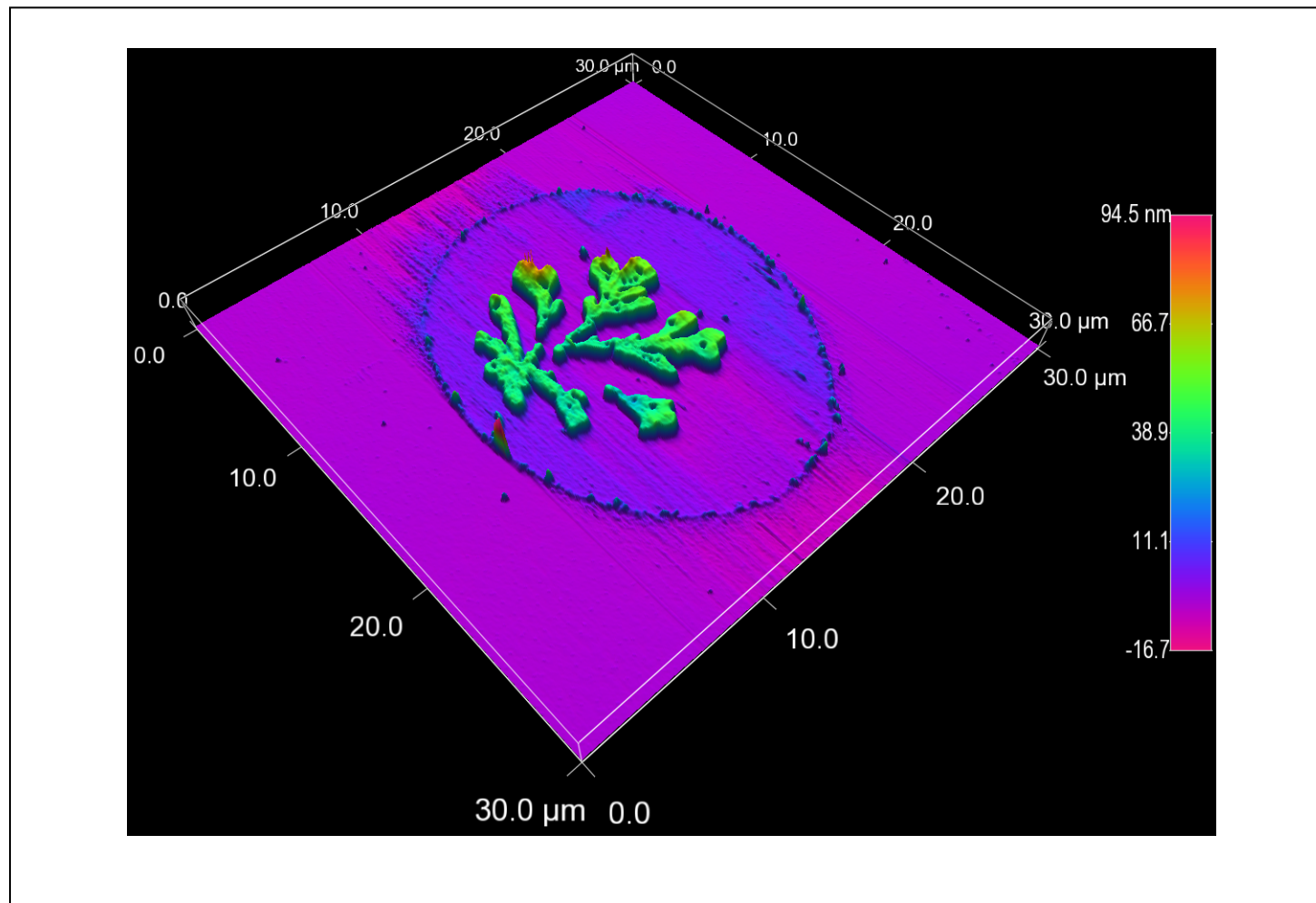
Instrument: JEOL, JSM-6500 P

Affiliation: Yonsei Univ. Seoul. Korea



Description:

Microdrop of aqueous PBS solution spotted on glass by means of a nanoarrayer. After drying, only drops edges survived along with a micro-flower that has grown from the residual salt.



Magnification: 30x30 μm²

Submitted by: Marco Salerno
& Silvia Dante

Instrument: Asylum Research MFP 3D

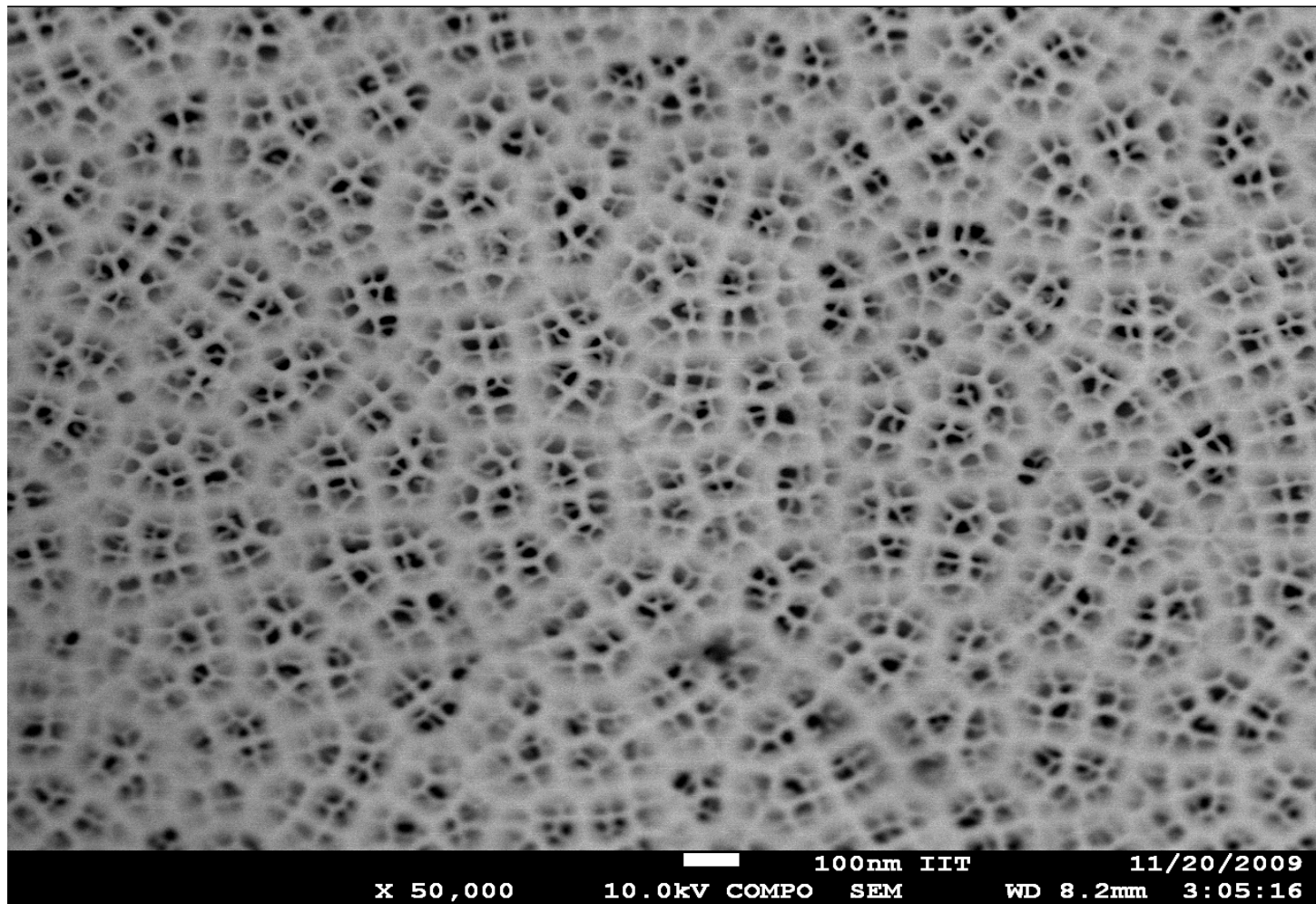
Affiliation: Italian Institute of Technology,
Genova, Italy



micro & nano - graph Title: "Spider nano-web"

Description:

Electrolyte side of anodic porous alumina grown in non-equilibrium conditions (galvanostatic mode at high current density). Pore splitting resulted in multiple pores appearing at the bottom, inside larger pore mouths at the top.



Magnification: 50,000 X

Submitted by: Niranjana Patra

Instrument: Jeol JSM- 7500 FA

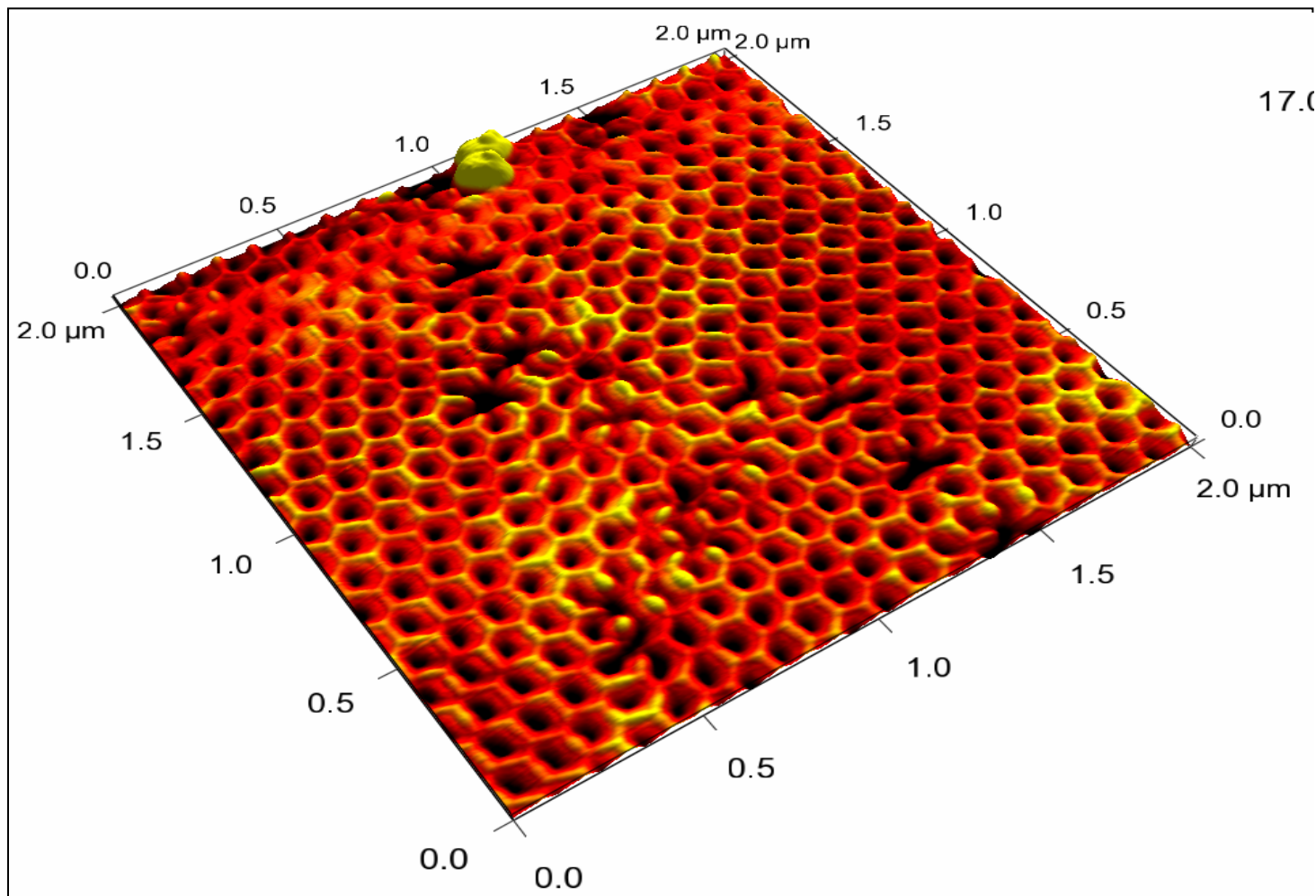
Affiliation: Italian Institute of Technology
Genova, Italy



Description:

AFM topography of ordered anodic porous alumina domains, electrolyte side.

Fabrication carried out in two steps potentiostatic anodization in 0.3 M aqueous oxalic acid at 40 V.



Magnification: $2 \times 2 \mu\text{m}^2$

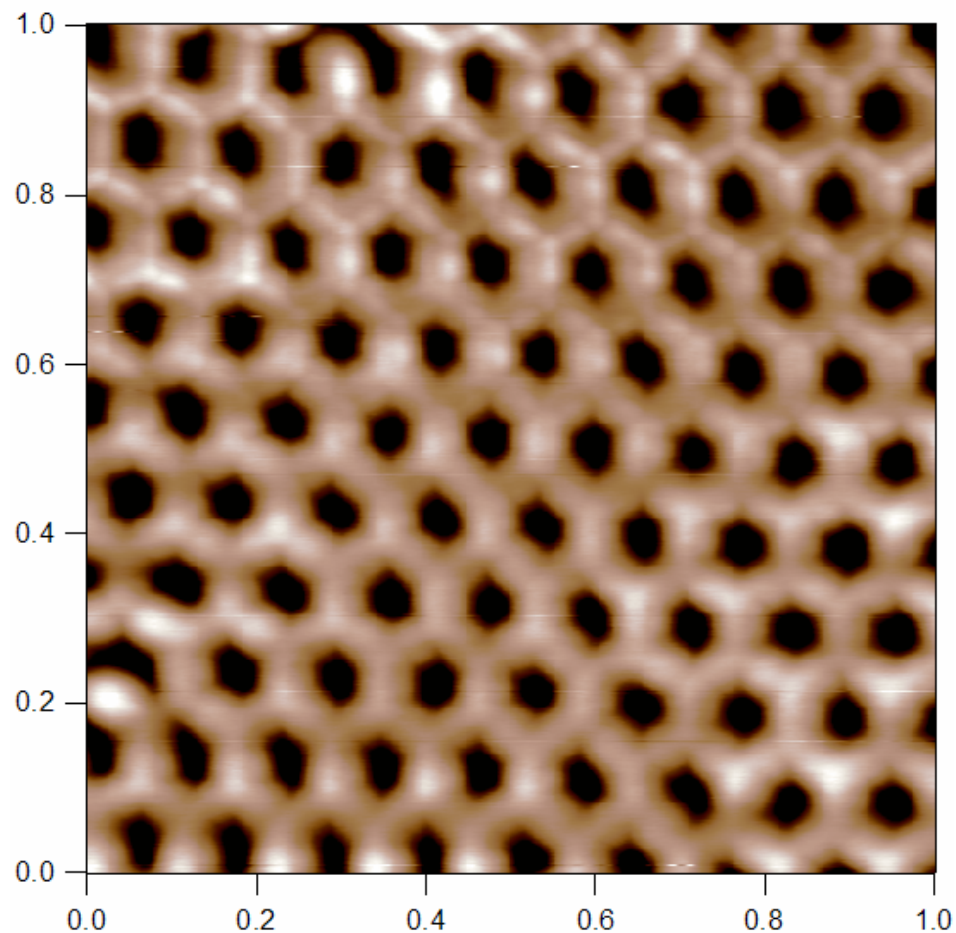
Submitted by: **Niranjan Patra**
 & **Marco Salerno**

Instrument: **Asylum Research MFP 3D**

Affiliation: **Italian Institute of Technology,**
Genova, Italy

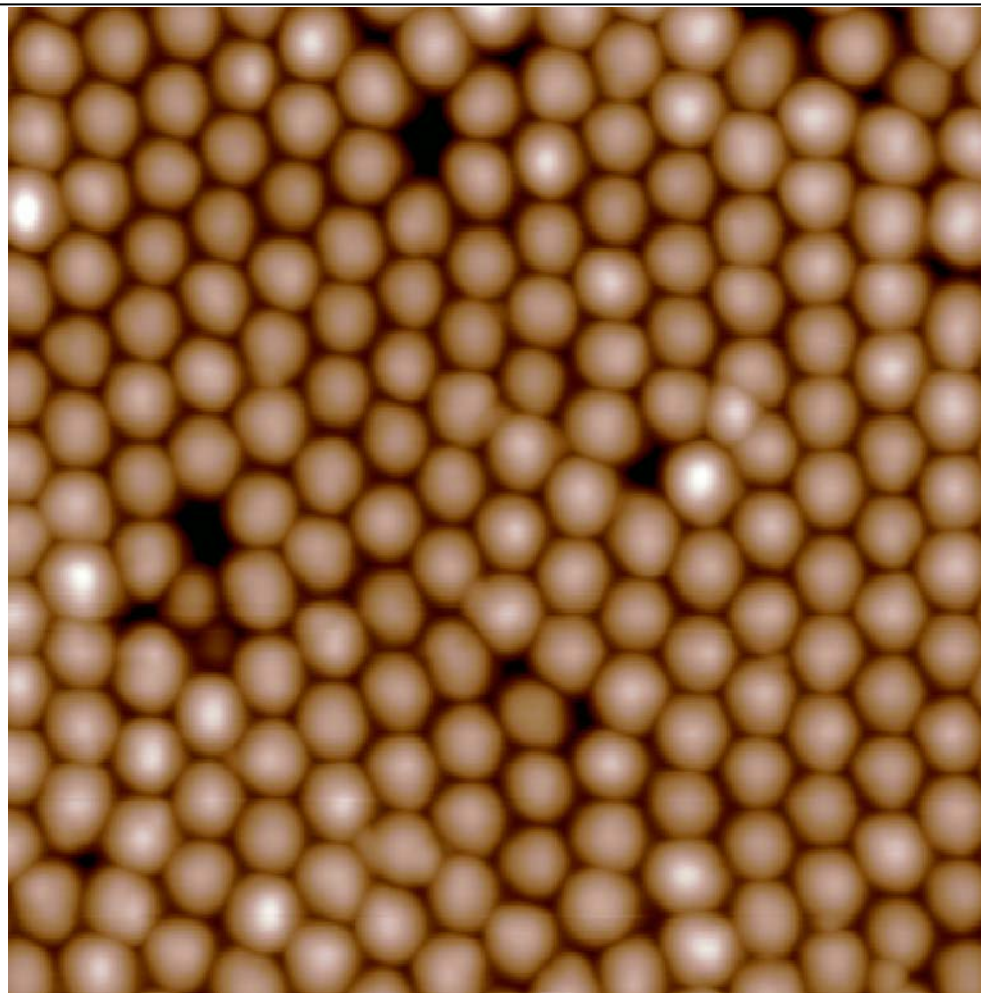
**Description:**

AFM topography of ordered anodic porous alumina. Fabrication carried out in two steps potentiostatic anodization in 0.3 M aqueous oxalic acid at 40 V.

**Magnification:** 1x1 μm^2 **Submitted by:** Niranjana Patra
& Marco Salerno**Instrument:** Asylum Research MFP 3D**Affiliation:** Italian Institute of Technology,
Genova, Italy

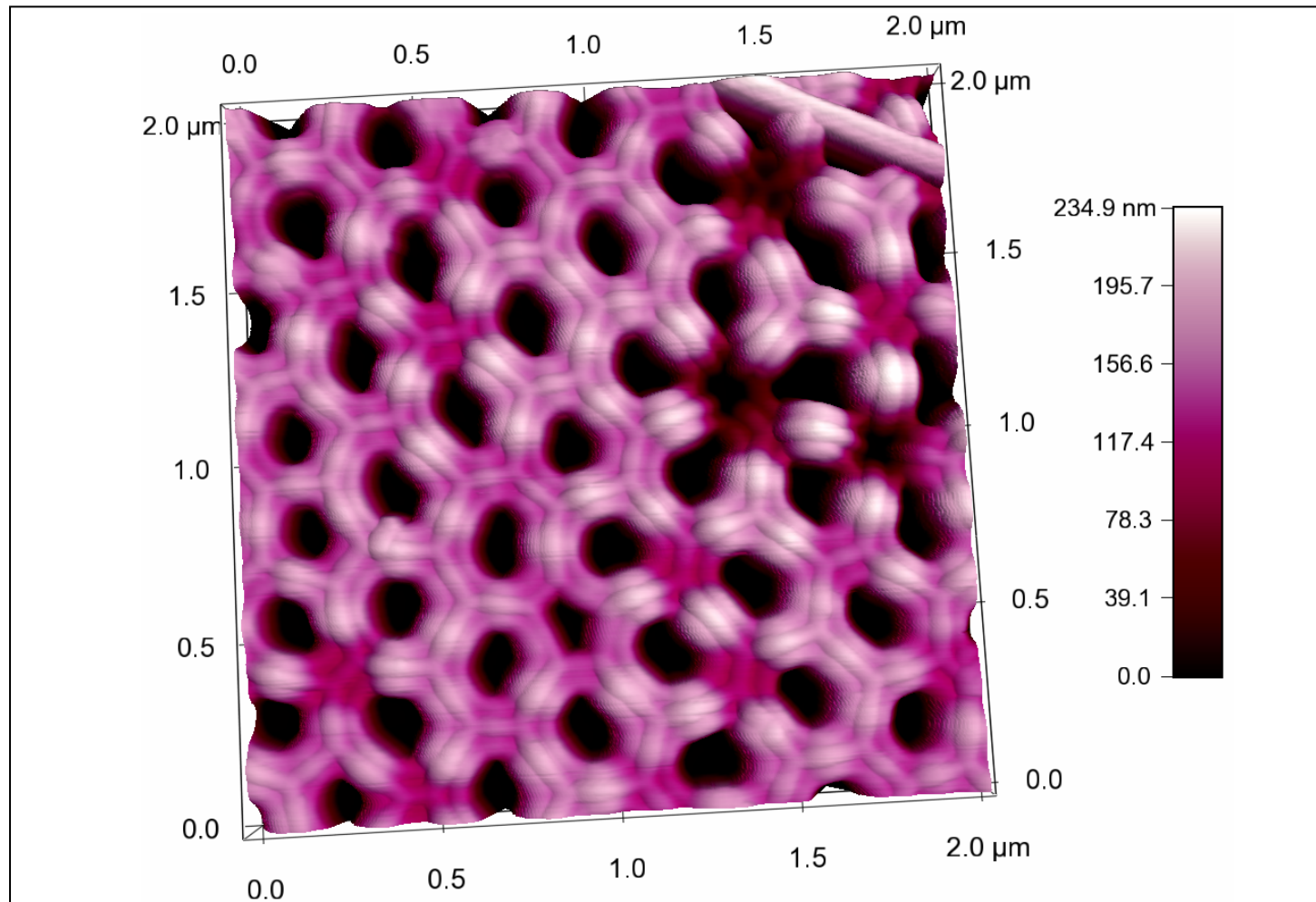
**Description:**

AFM topography of anodic porous alumina barrier layer, (bottom side of the oxide membrane after etching the aluminium substrate).

**Magnification:** 1.5x1.5 μm^2 **Submitted by:** Niranjana Patra
& Marco Salerno**Instrument:** Asylum Research MFP 3D**Affiliation:** Italian Institute of Technology,
Genova, Italy

**Description:**

AFM topography of ordered anodic porous alumina. Metal side of the membrane. Cell boundaries exhibit contrast probably due to compressive stress during pore self-assembly or different oxide composition and resulting etching rate during pore opening.

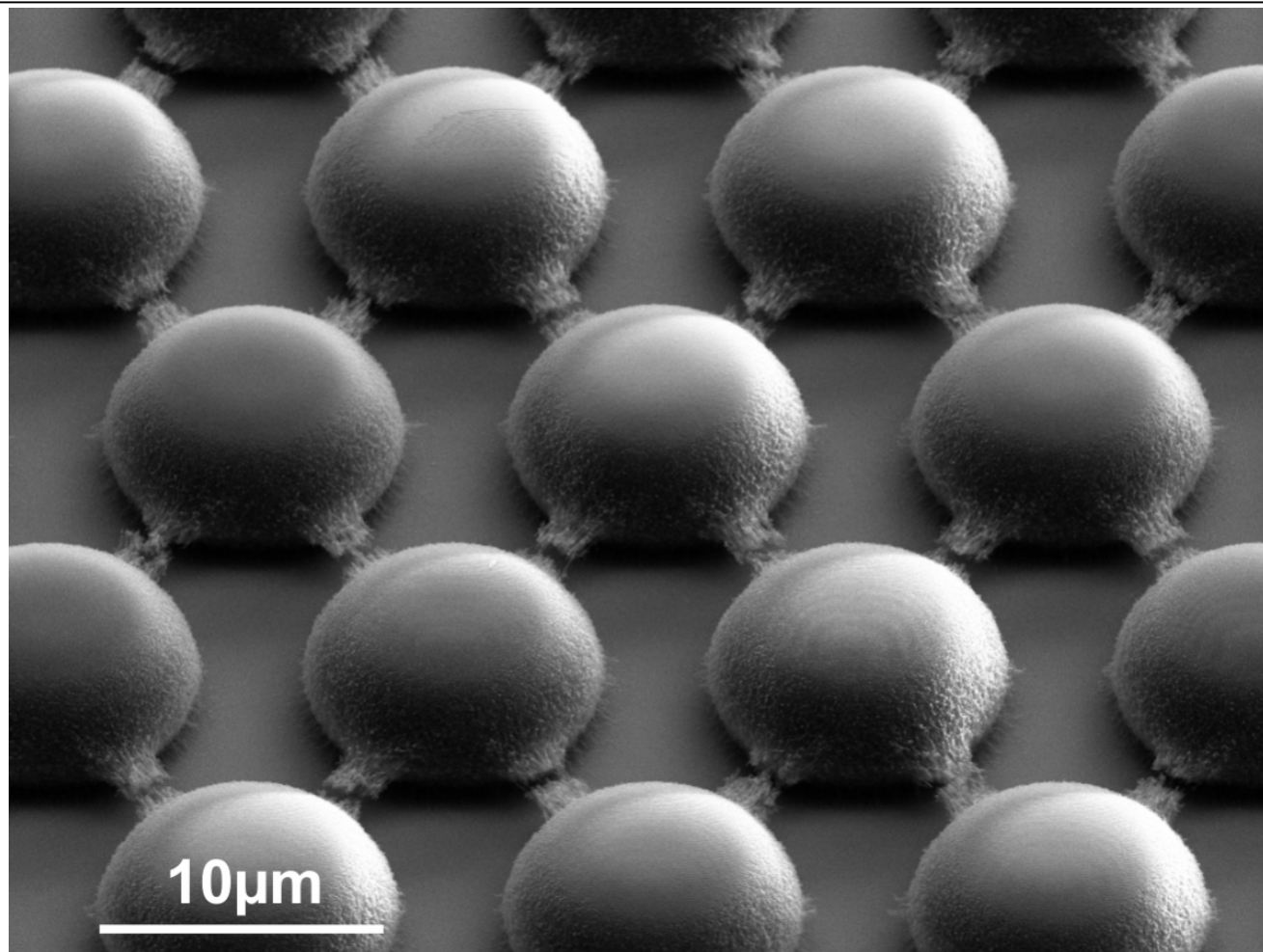
**Magnification:** 2x2 μm^2 **Submitted by:** Niranjana Patra
& Marco Salerno**Instrument:** Asylum Research MFP 3D**Affiliation:** Italian Institute of Technology,
Genova, Italy

**Description:**

Micro-spheres of **7.5 μm thick SU-8 resist** exposed by **EBL with 25kV**.

Cross-linked resist exceeds the boundaries of the spheres and tries to reach the neighbor sphere

This results in **free standing bridges** with gaps in between.



Magnification: **1.3KX**

Submitted by: **Guido Piaszenski**

Instrument: **RAITH150-TWO**

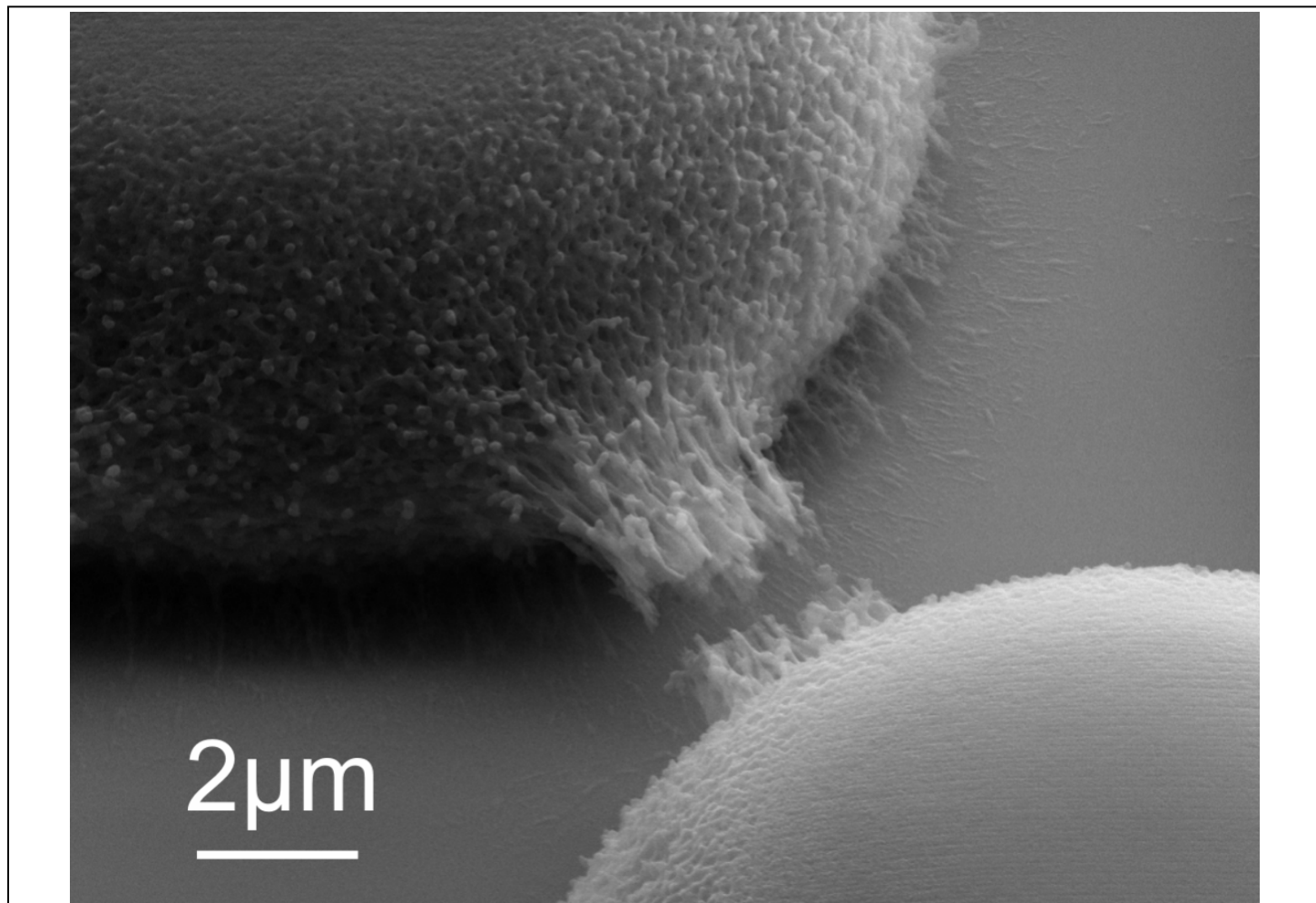
Affiliation: **Raith GmbH, Dortmund, Germany**

**Description:**

Micro-spheres of
7.5 μm thick SU-8
resist exposed by
EBL with 25kV.

Cross-linked resist
exceeds the
boundaries of the
spheres and tries
to reach the
neighbor sphere

This results in **free
standing bridges**
with gaps in
between.



Magnification: 6KX

Submitted by: Guido Piaszenski

Instrument: RAITH150-TWO

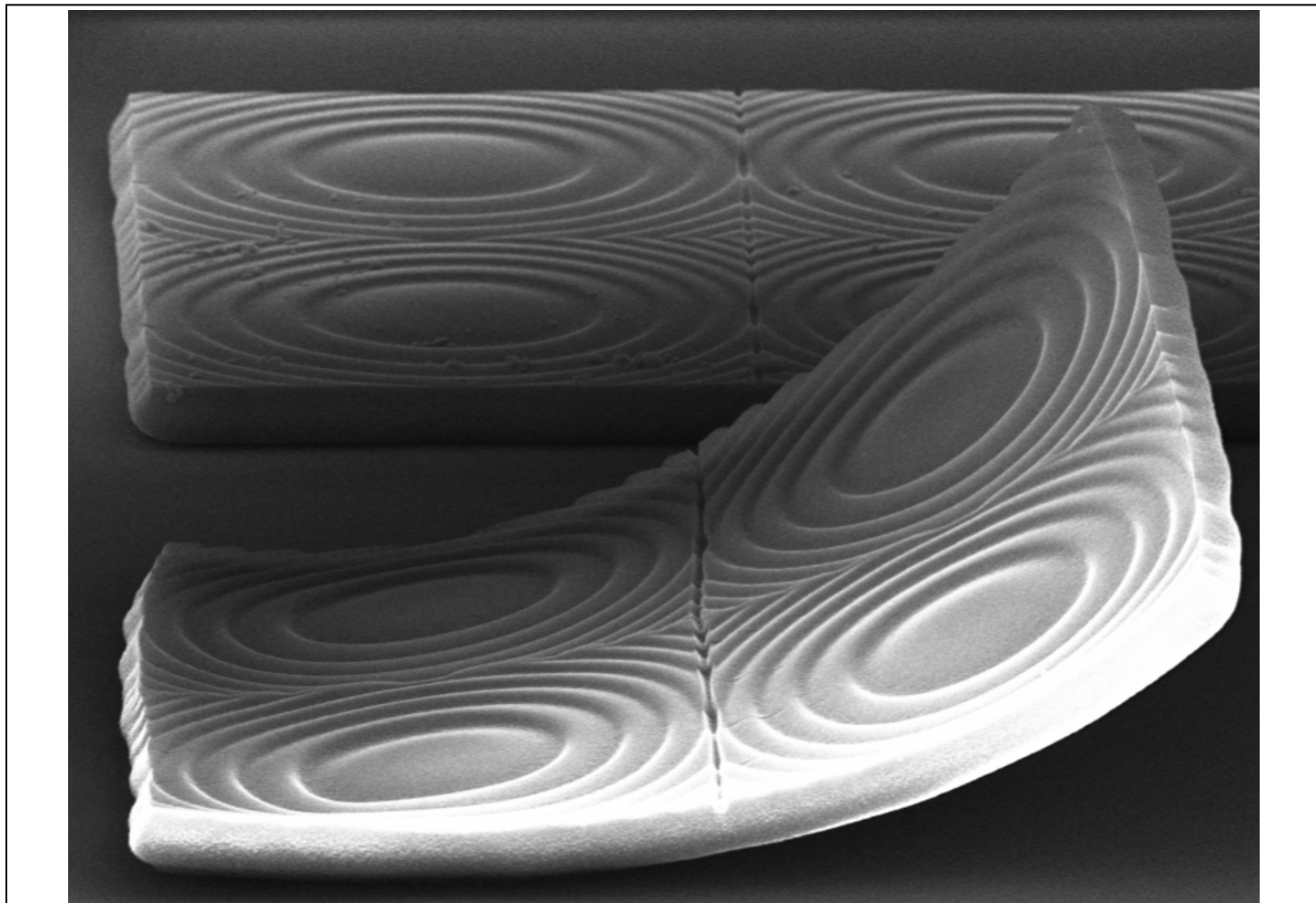
**Affiliation: Raith GmbH, Dortmund,
Germany**

**Description:****10kV EBL**

exposure of $2\mu\text{m}$
thick SU-8 resist
cross-links only
the top part of the
resist.

During resist
development, the
stable structure
detaches from the
ground and bends.

Might be cool if
spacetime
bending comes
into play...



Magnification: 880X

Submitted by: Guido Piaszenski

Instrument: RAITH150-TWO

Affiliation: Raith GmbH, Dortmund, Germany

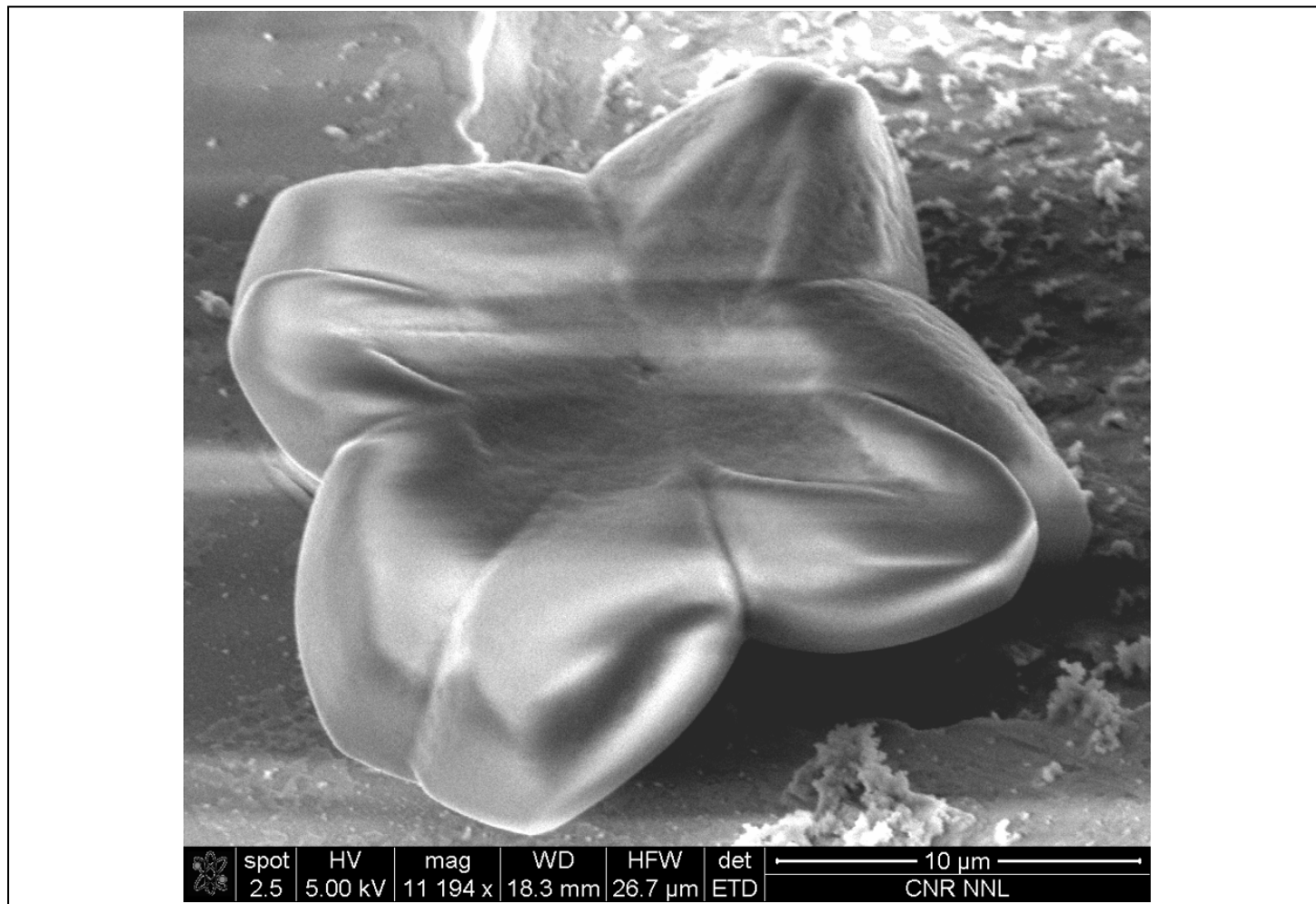


micro & nano - graph Title:

“A KOH crystal quatrefoil: next time my process will be luckier!”

Description:

After a very long silicon etching in KOH (28% w/w) for bulk micromachining, you can be sometimes very tired. You would prefer the water rinsing lasts few seconds but my rinsing was not enough to remove KOH residues. They crystallized in a flower shape.



Magnification: **Scale on the picture**

Submitted by: **Francesco Rizzi**

Instrument: **FEI Nova NanoSEM 200 System**

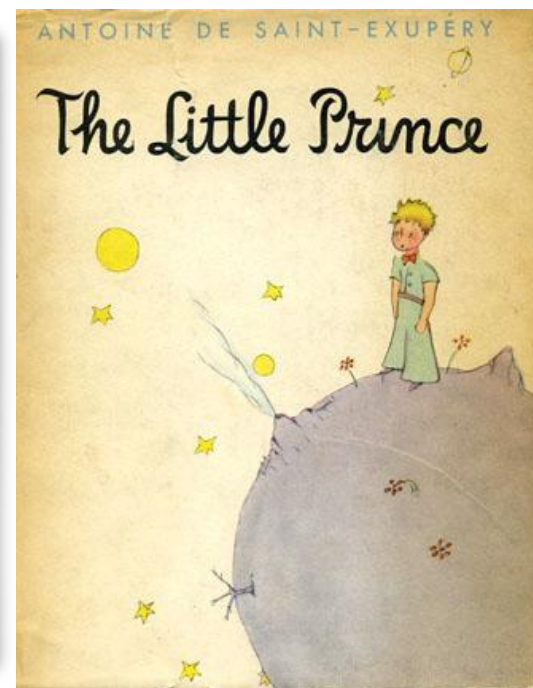
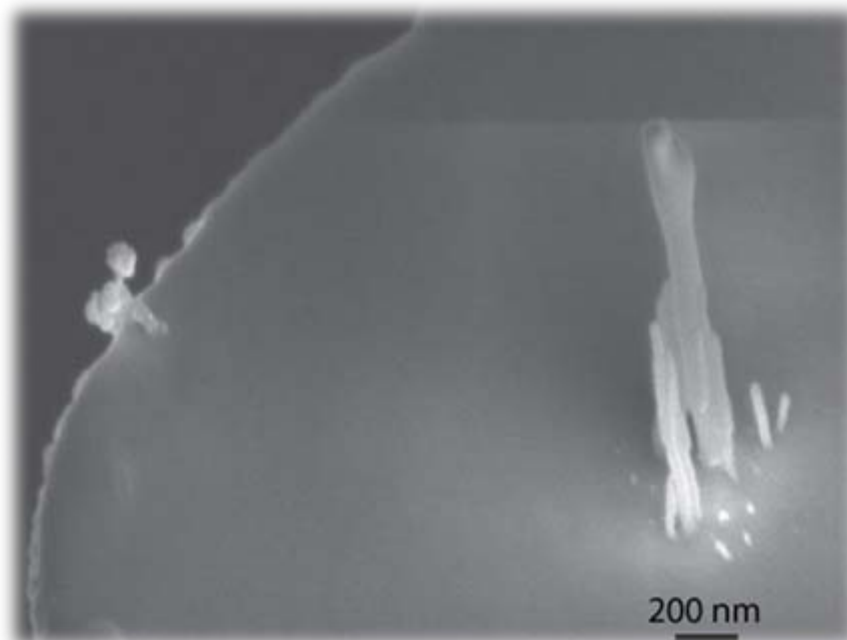
Affiliation: **CBN-IIT@UniLe
Lecce, Italy**

Francesco Rizzi



Description:

Carbon nanotubes grown from 20 nm thick Ni catalyst which was deposited through a 200 nm diameter stencil aperture on a semi-released cantilever body. The prince I just found there - wondering about it all...



Magnification: 100 KX

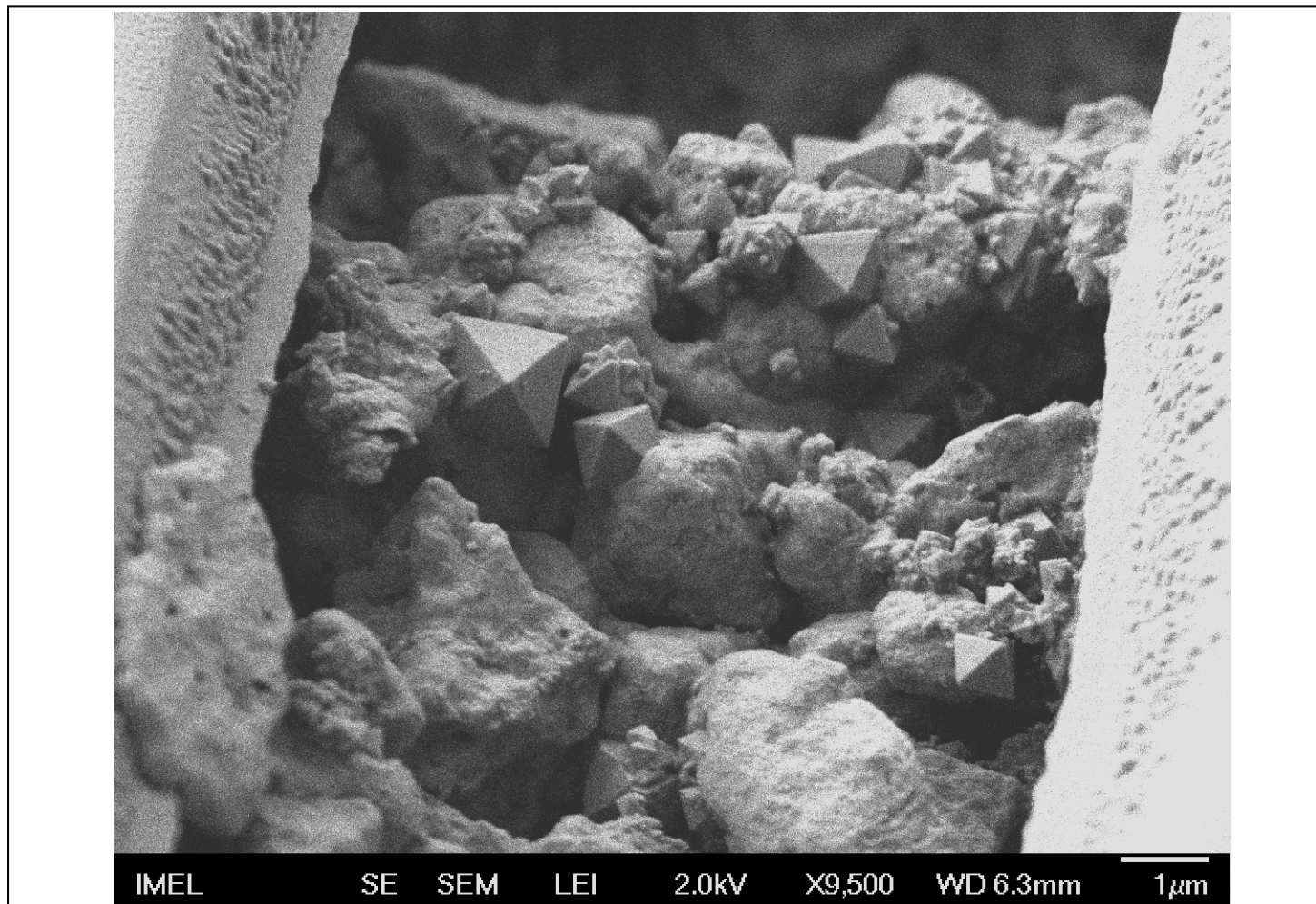
Submitted by: Veronica Savu

Instrument: Zeiss LEO 1550

Affiliation: EPFL, Lausanne, Switzerland

**Description:**

Liquid deposition
of $\text{TiO}_2 - \text{ZrO}_2$
inside PMMA
microchannels



Magnification: **X9.500**

Submitted by: **Tsougeni Katerina**

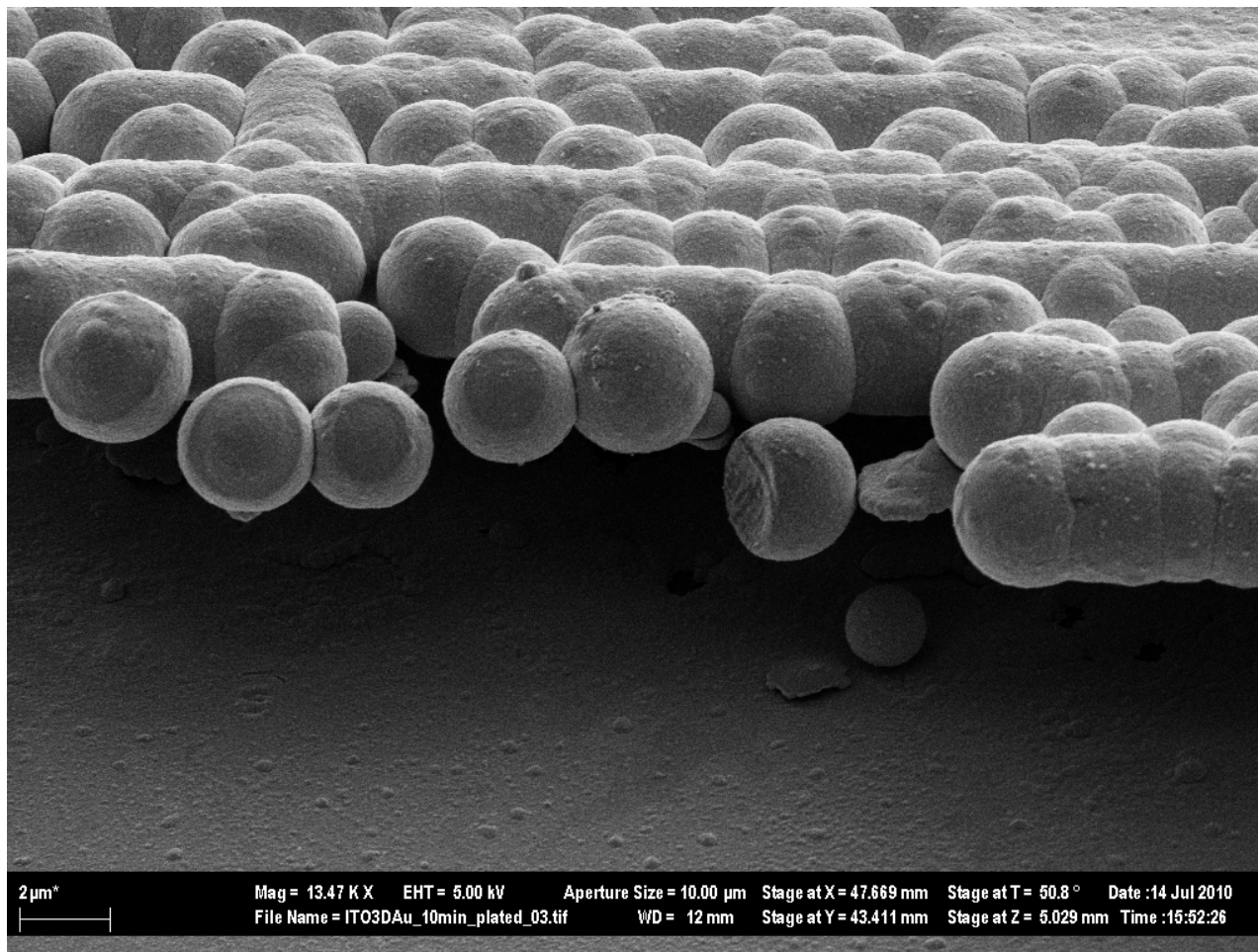
Instrument: **JEOL JSM-7401F FEG SEM**

Affiliation: **NCSR Demokritos**

Institute of Microelectronics, Greece

**Description:**

Trying to electroplate cool nanostructures but ended up with PsychoEyes.



Magnification: 13.47 KX

Submitted by: Birgit Päivänranta

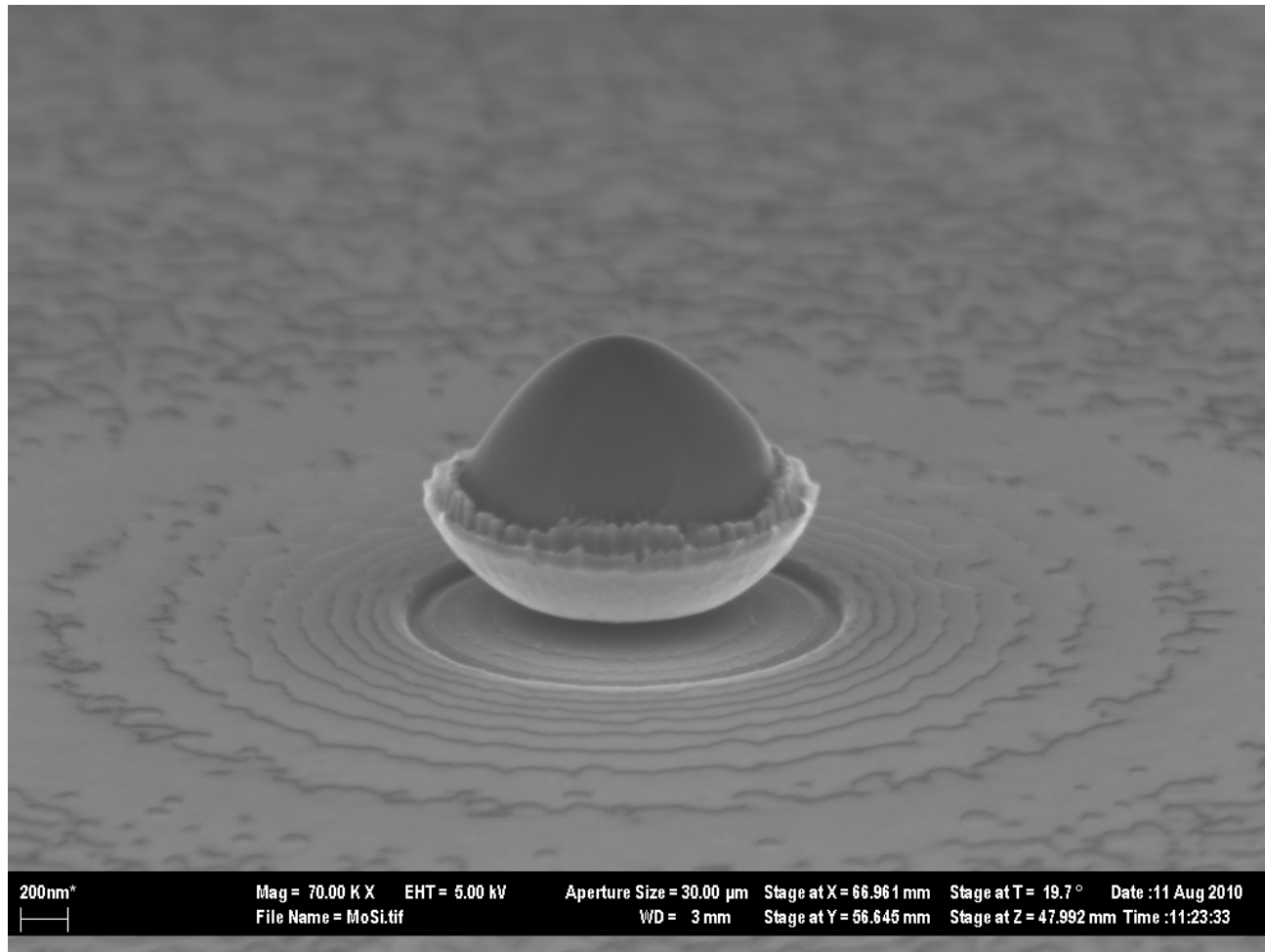
Instrument: Carl Zeiss, Supra 55VP

Affiliation: Paul Scherrer Institut

Villigen, Switzerland

**Description:**

The nano nut of squirrel Scrap from Ice Age movie was found after etching Mo/Si multilayer with ICP.



Magnification: 70 KX

Submitted by: Birgit Päiväranta

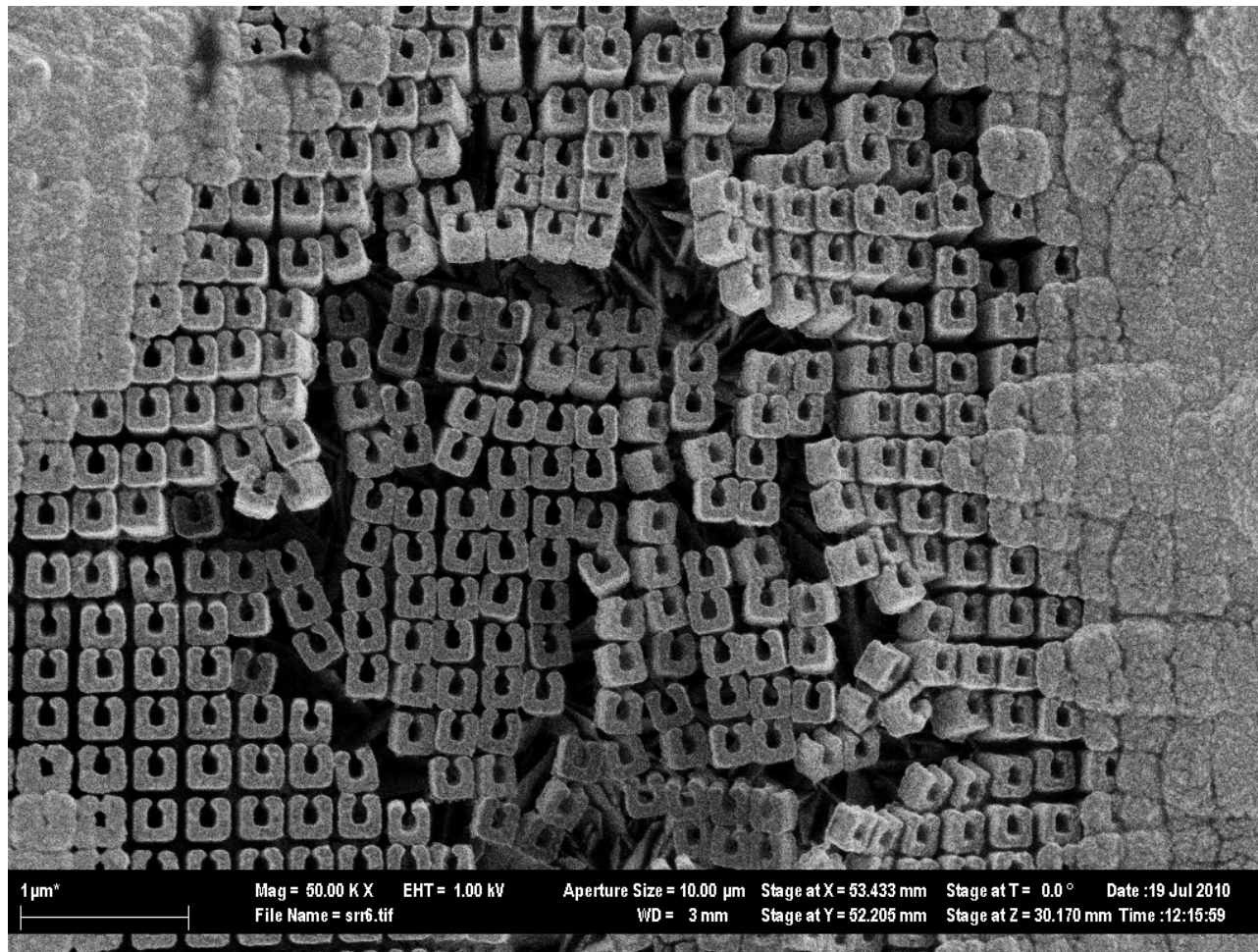
Instrument: Carl Zeiss, Supra 55VP

Affiliation: Paul Scherrer Institut

Villigen, Switzerland

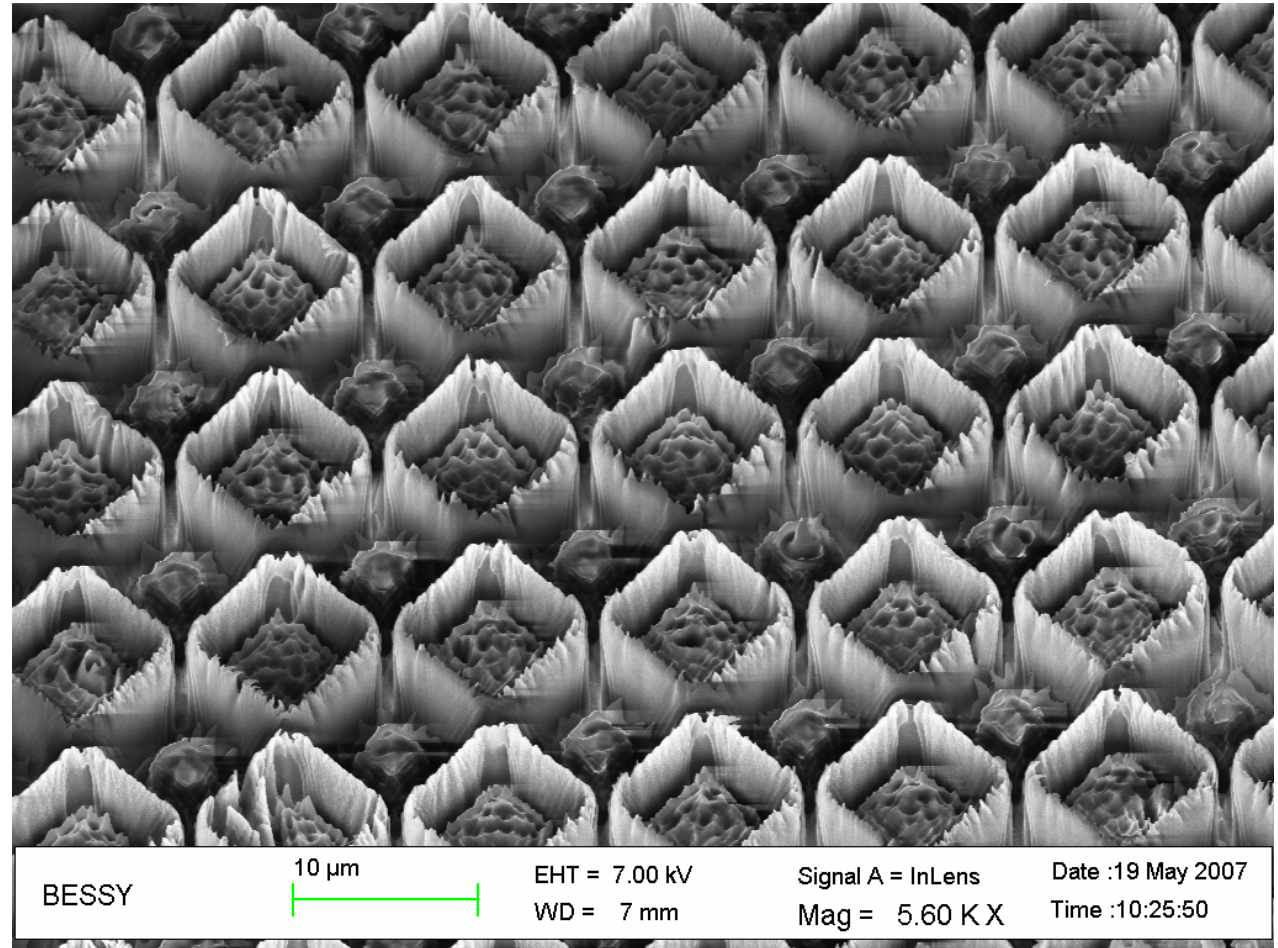
**Description:**

After electroplating of gold a small adhesion problem seemed to occur and all split rings looked like after an earthquake.

**Magnification: 50 KX****Submitted by: Birgit Päiväranta****Instrument: Carl Zeiss, Supra 55VP****Affiliation: Paul Scherrer Institut
Villigen, Switzerland**



Description:
Small imprinting
defect.

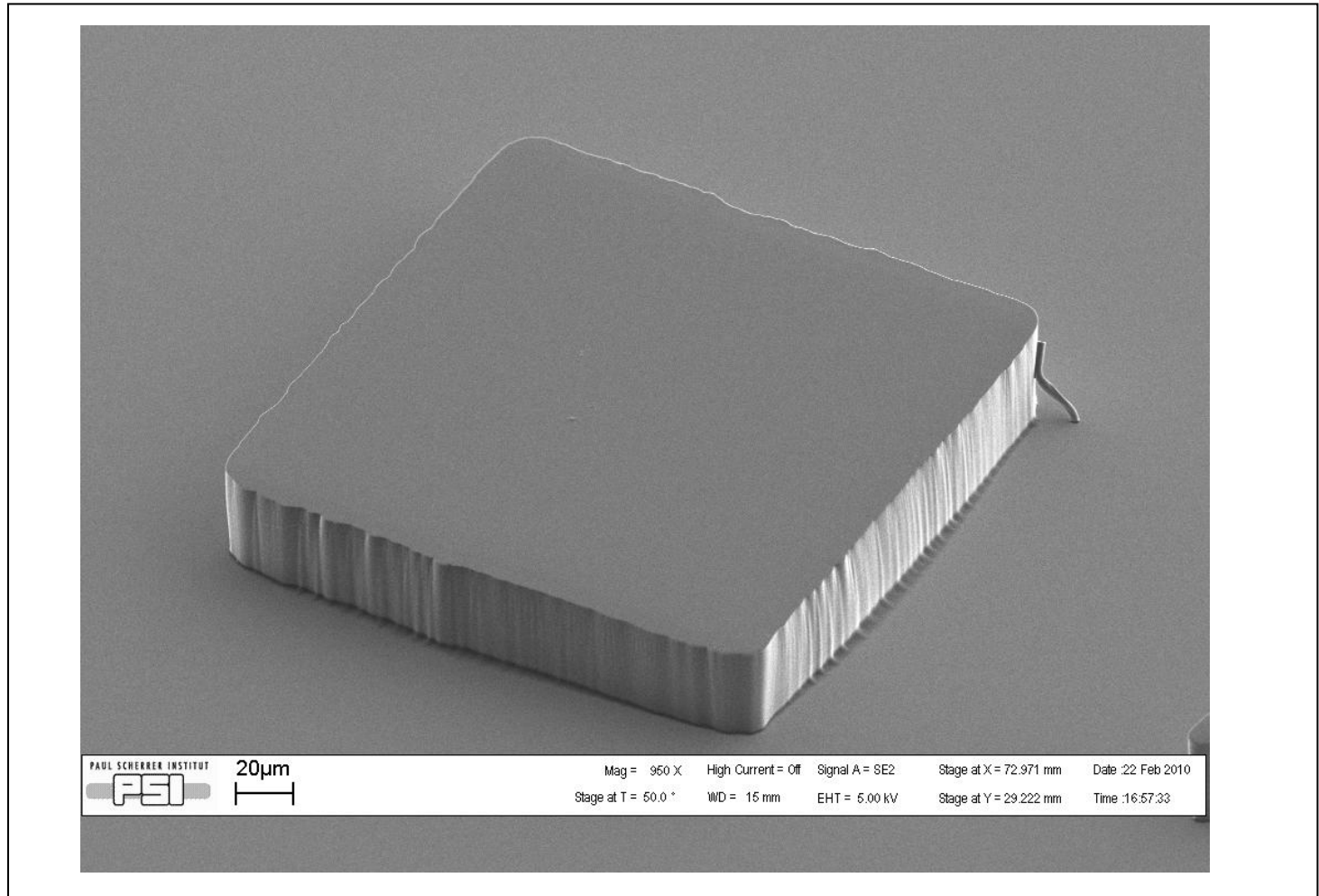


Magnification: 5.60 KX

Submitted by: Birgit Päivänranta
Arne Schleunitz

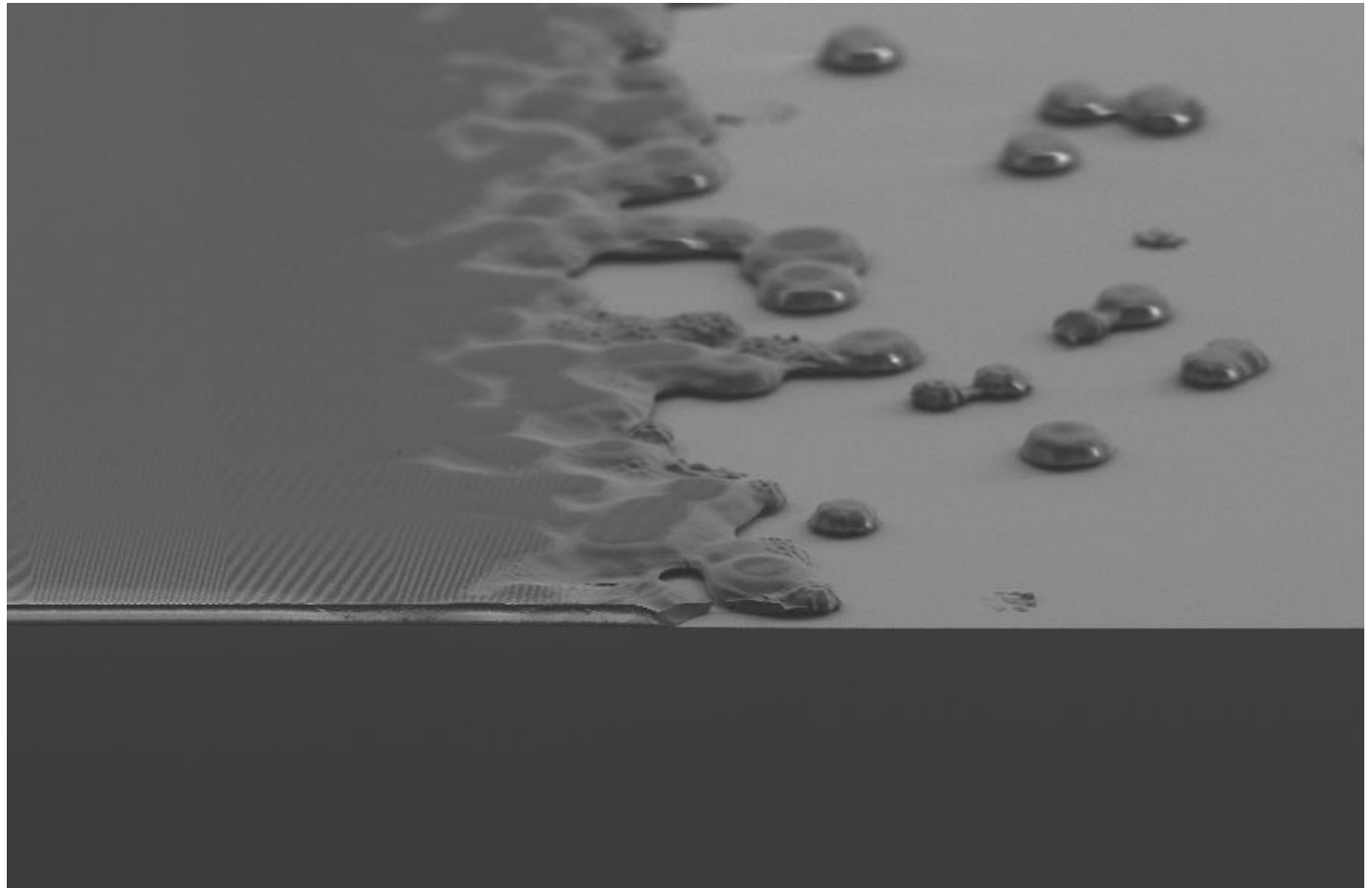
Instrument: Carl Zeiss, Supra 55VP

Affiliation: Paul Scherrer Institut
Villigen, Switzerland

**Description:**
Imprint defect**Magnification: 950 X****Submitted by: Birgit Päiväranta
Arne Schleunitz****Instrument: Carl Zeiss, Supra 55VP****Affiliation: Paul Scherrer Institut
Villigen, Switzerland**

**Description:**

After electroplating of gold a small adhesion problem seemed to occur and all split rings looked like after an earthquake.

**Magnification: 905 X****Submitted by: Birgit Päivänranta
Arne Schleunitz****Instrument: Carl Zeiss, Supra 55VP****Affiliation: Paul Scherrer Institut
Villigen, Switzerland**



“Pick a title that the judges will change”

Description:

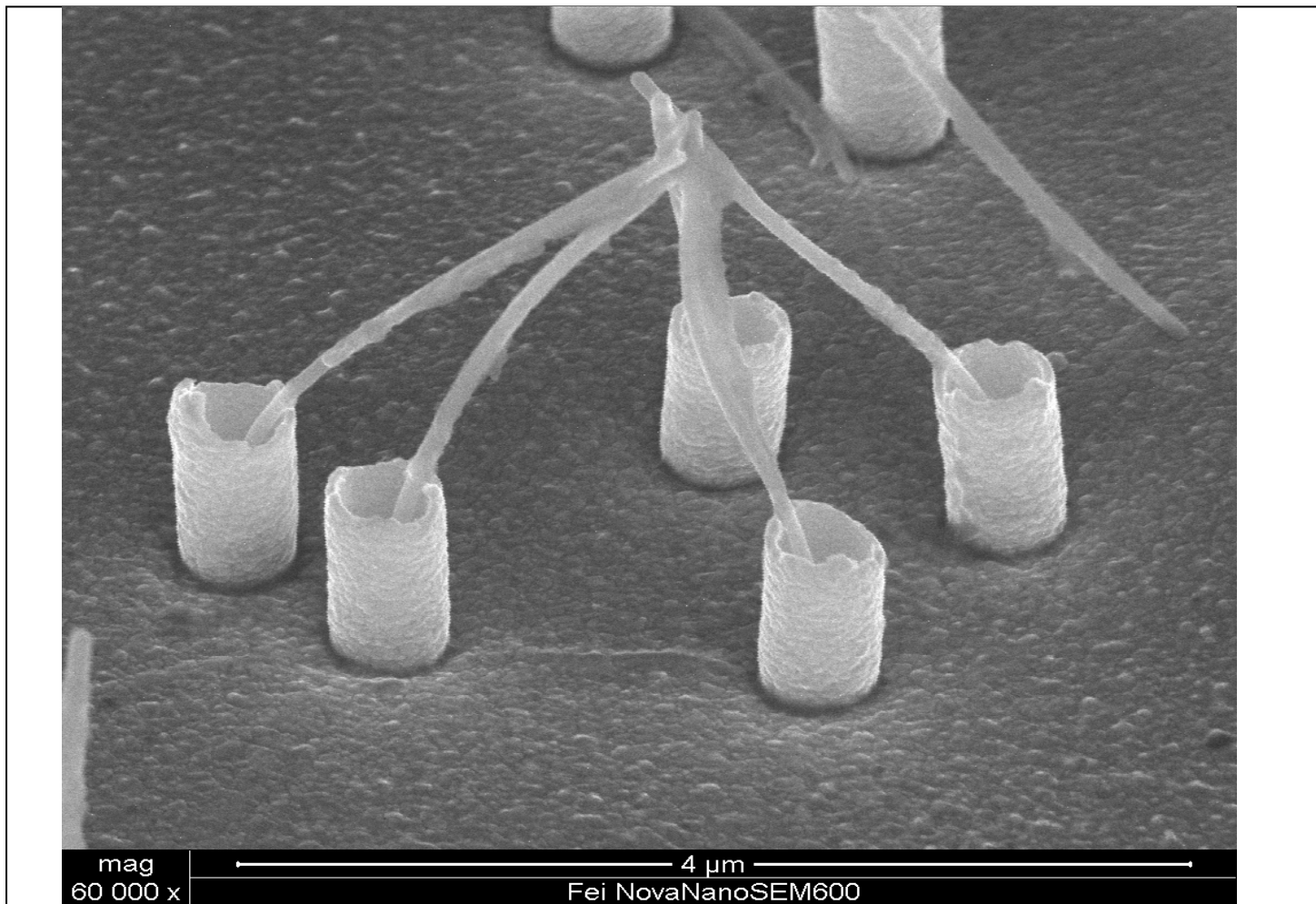
Nanowires with wrap-around gates.

Name of the photo:

Party on the Beach

Or

Lemon with a straw on the beach



Magnification: 60.000X

Instrument: NovananoSEM 600

Submitted by: Frans Holthuysen

Affiliation: Philips Research Eindhoven Netherlands