
IGHT

Narzędzia dla nanobiotechnologii

Ignacy Mościcki

Oferta firmy IGHT

- Stoły antywibracyjne
- Mikroskopia SPM
- Nanoindentacja
- Badania cząstek
- Sondy oraz akcesoria

Accurion

Aktywne stoły antywibracyjne

NT-MDT

Mikroskopia SPM

- Edukacja
- Laboratorium
- Badania
- Wytwarzanie

NT-MDT
INTEGRATED SOLUTIONS FOR NANOTECHNOLOGY

Edukacja SPM

- Brak kosztów eksploatacji
- Nowoczesna elektronika
- Wymienne głowice
- System studencki

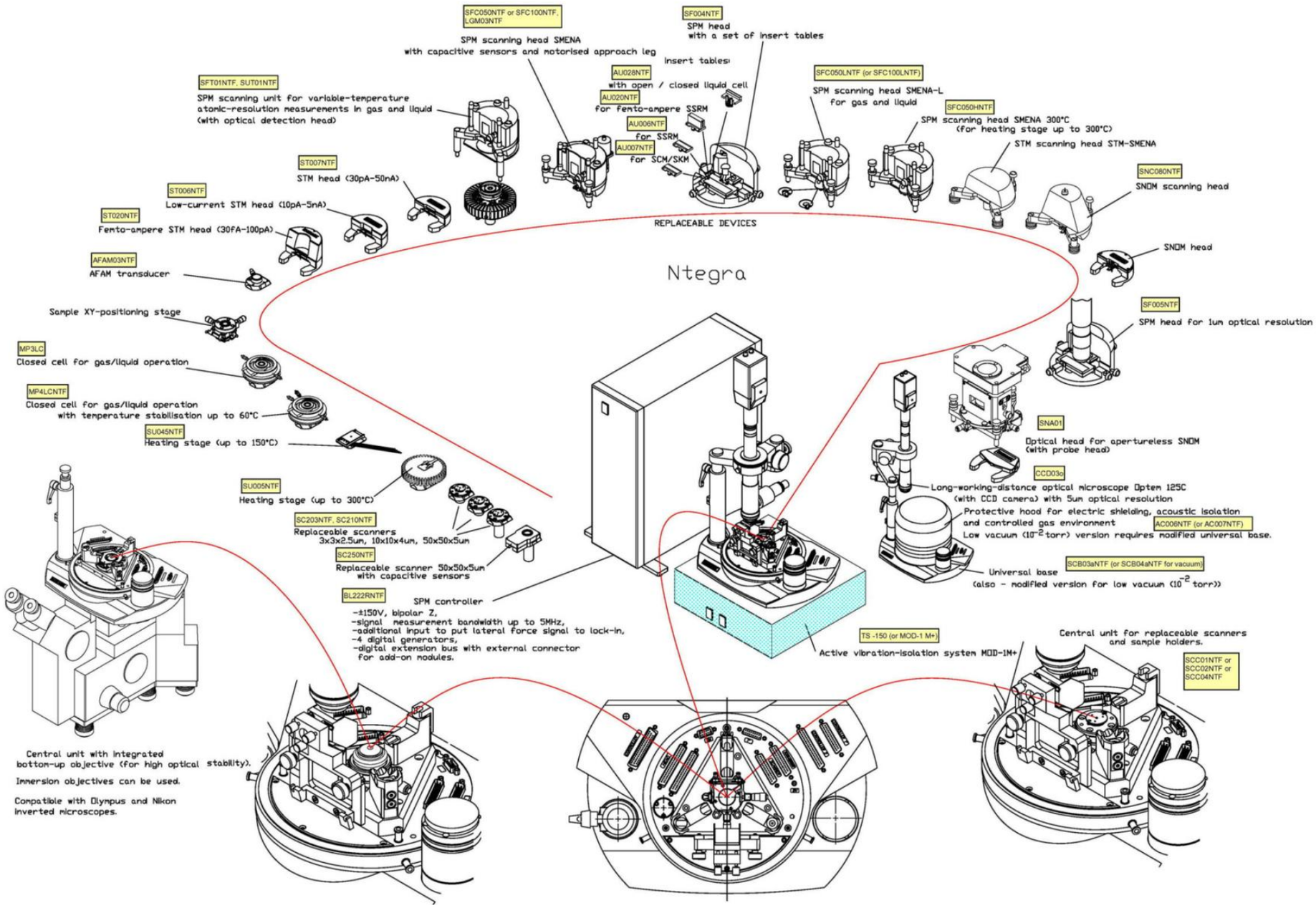
NANO EDUCATOR
SCANNING PROBE MICROSCOPE

Edukacja SPM

Laboratorium SPM

- Szybka i intuicyjna obsługa
- Automatyzacja
- AFM i STM
- EFM/MFM
- Badania w cieczy
- Nanosklerometria

Systemy badawcze SPM



Techniki SPM

- **STM techniques**
  - Constant Current mode
  - Constant Height mode
  - Barrier Height imaging
  - Density of States imaging
  - I(z) Spectroscopy
  - I(V) Spectroscopy
- **AFM**
  - dc Contact techniques
    - Constant Height mode
    - Constant Force mode
    - Contact Error mode
    - Lateral Force Imaging
    - Spreading Resistance Imaging
    - Contact Scanning Capacitance Microscopy
  - ac Contact techniques
    - Force Modulation mode
    - Contact EFM
    - AFAM
    - AFAM Resonance Spectroscopy
    - Piezoresponse Force Microscopy
  - Semicontact techniques
    - Semicontact mode
    - Phase Imaging mode
    - Semicontact Error mode
  - Non-Contact techniques
    - Non-Contact mode
    - Frequency Modulation mode
  - Many-pass techniques
    - EFM
    - Scanning Capacitance Microscopy
    - Kelvin Probe Microscopy
    - DC MFM
    - AC MFM
    - Dissipation Force Microscopy
- **Spectroscopies**
  - Force-distance curves
  - Adhesion Force imaging
  - Amplitude-distance curves
  - Phase-distance curves
  - Frequency-distance curves
  - Full-resonance Spectroscopy
- **SNOM**
  - Shear Force Microscopy
  - Transmission mode
  - Reflection mode
  - Luminescence mode
  - SNOM Lithography
- **aSNOM techniques**
  - Scanning Plasmon Near-field Microscopy
- **Lithographies**
  - AFM Oxidation Lithography
  - STM Lithography
  - AFM Lithography - Scratching
  - AFM Lithography - Dynamic Plowing
- **Confocal Microscopy techniques**
  - Laser mode
  - Image mode
  - Spectral mode
  - Confocal Volume Lithography

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SPM Techniques

- SPM Principles

  Animated schemes and short descriptions of operation modes for main types of SPM - Scanning Tunneling Microscope, Atomic Force Microscope, Magnetic Force Microscope, Scanning Near-Field Opical Microscope

- SPM Basics

  Scanning Probe Microscopy physical basics including theoretical descriptions of main modes and interactive models

- SPM Methodology

  Scanning Probe Microscopy methodologies of measuring different types of samples, in different enviroments, with use of different modes.

- SPM Textbooks

  Scanning Probe Microscopy textbooks oriented to using of NT-MDT devices.

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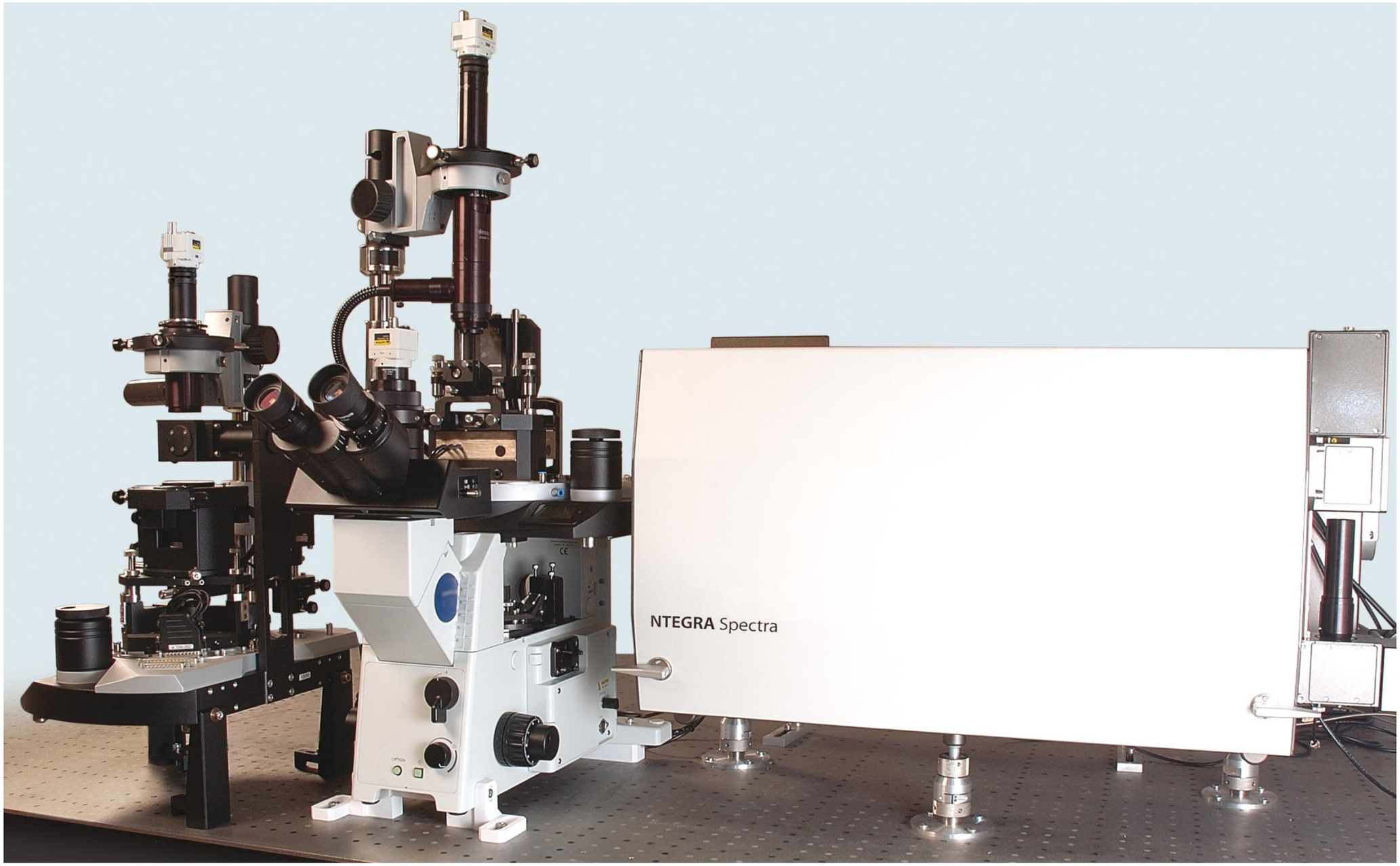

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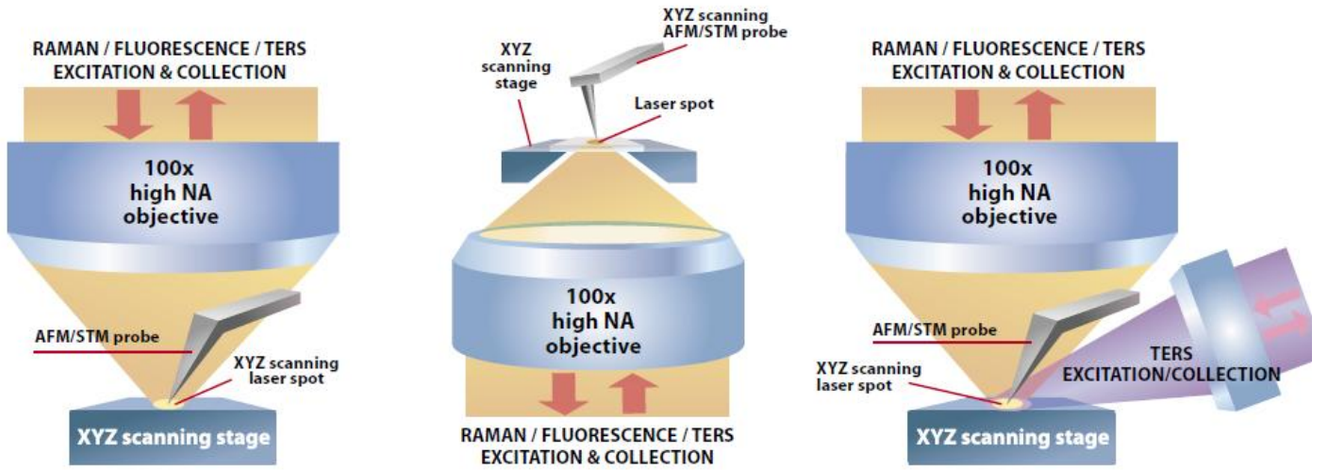
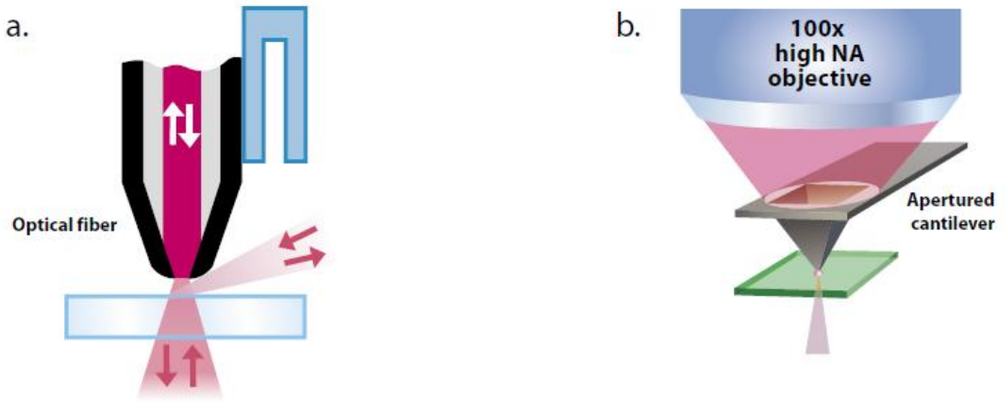
Solution for all possible excitation/detection and TERS geometries



Scanning Near-Field Optical Microscopy



a) Based on quartz SNOM fiber, shear-force feedback
b) Based on silicon cantilevers with nanofabricated aperture

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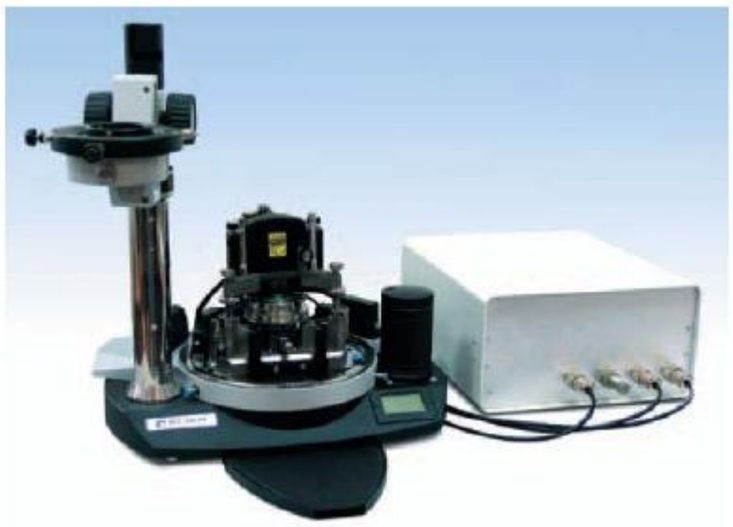

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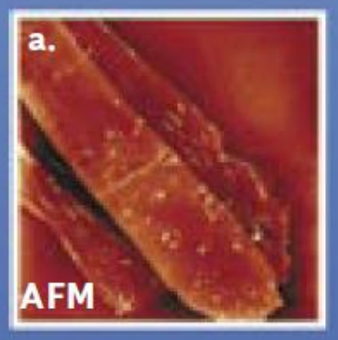
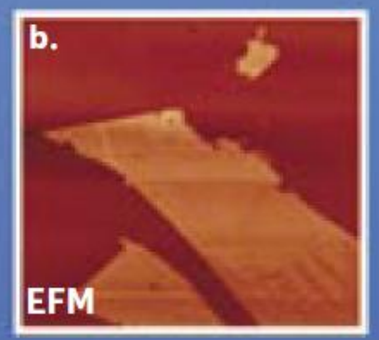
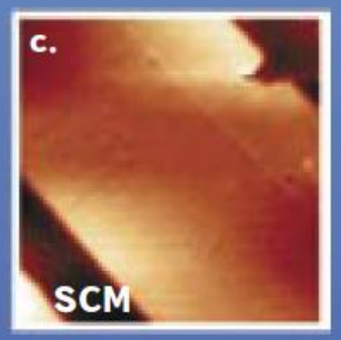
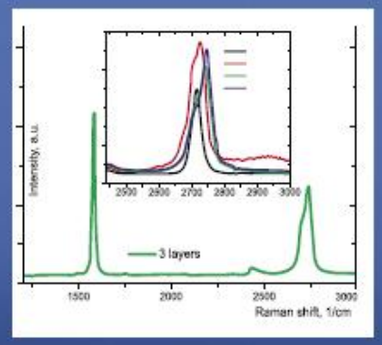
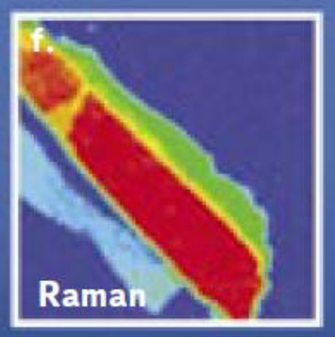
The same graphene sample studies in the one experiment











a) AFM topography. Size 50x50 μm
d) Scanning Kelvin probe microscopy. Size 90x80 μm

b) Electrostatic force microscopy. Size 65x55 μm
e) Raman spectra of graphene flakes with different thickness

c) Scanning capacitance microscopy. Size 25x25 μm
f) Confocal Raman map (2D band mass center)

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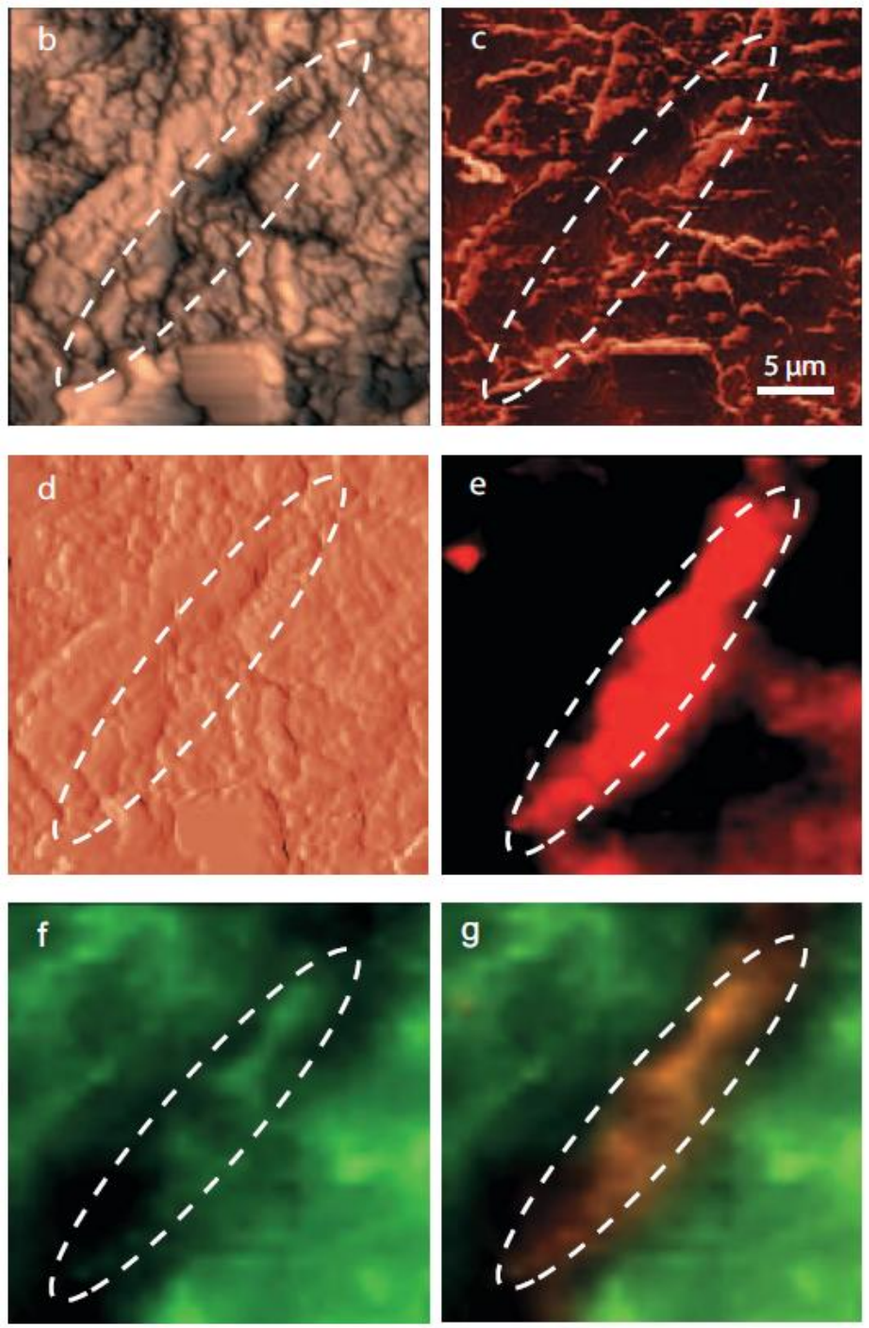

ANADIN tablet measurements
with NTEGRA Spectra:
(b) AFMheight, (c) AFMphase ,
(d) AFMmag, (e) Raman mapping
Paracetamol distribution;
(f) Raman mapping - Aspirin distribution;
(g) Components on the tablet
(red color corresponds to Paracetamol,
green color corresponds to Aspirin);

Compound Distribution Studies in Pharmaceutical Tablets by Integrated AFM-Raman Instrument

Sergey Shashkov , Pavel Dorozhkin

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Finding a needle in a chemical haystack: tip-enhanced Raman scattering for studying carbon nanotubes mixtures

K L Andrew Chan and Sergei G Kazarian

Nanotechnology 21 (2010)

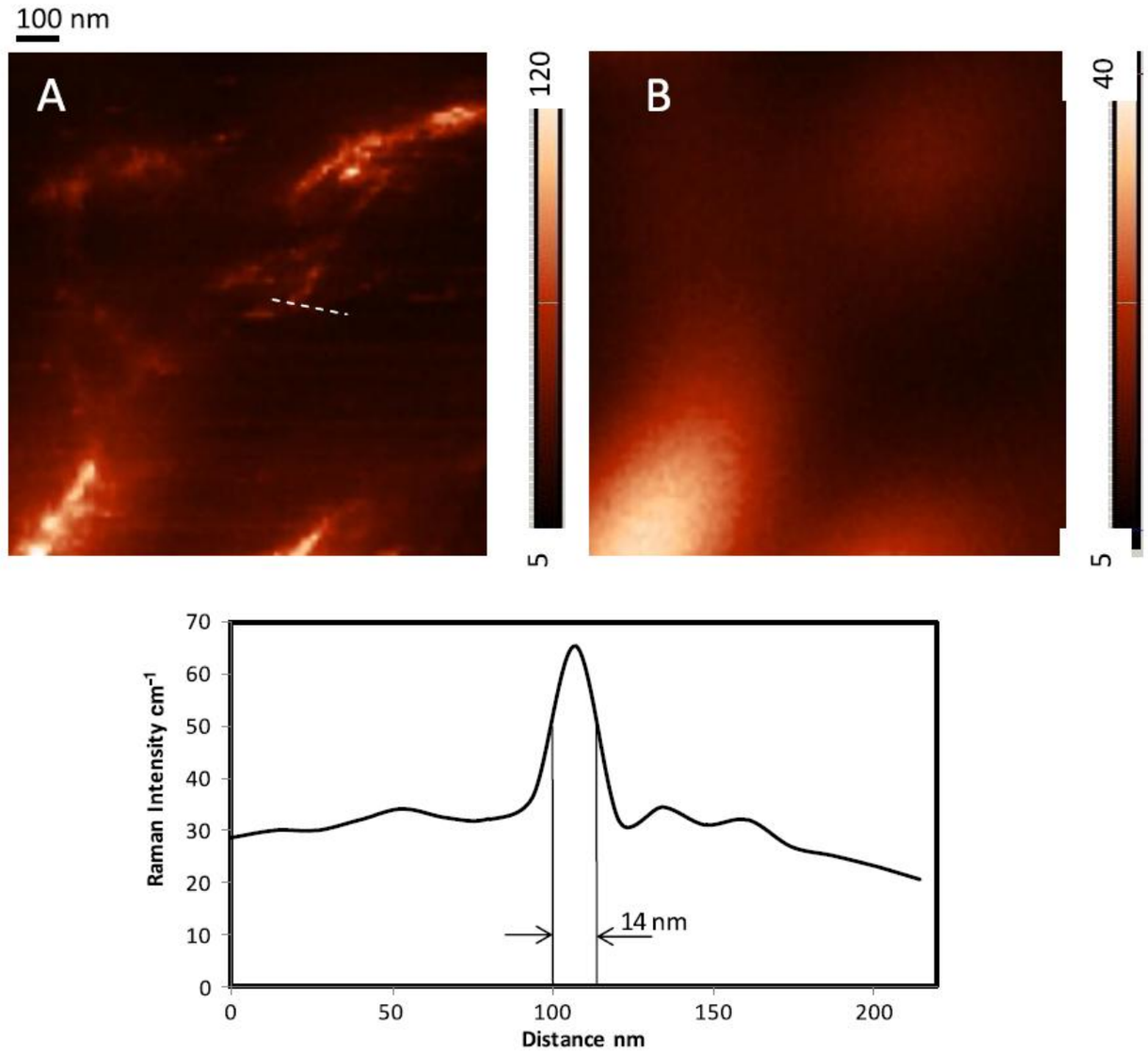


Figure 2. TERS image of dispersed SWCNTs, type A. The images are generated based on the intensity of the SWCNT G band at 1596 cm^{-1}. Image (A) shows the result when the tip is approaching. Image (B) shows the result when tip is retracted. The plot has shown the Raman intensity profile along the dotted line marked on (A).

Hysitron

- Właściwości mechaniczne w skali nano
- Laboratorium
- Badania

HYSITRON®
NANOMECHANICAL TEST INSTRUMENTS

Nanoindentacja

Makro:

$$2\ N < F < 30\ kN$$

Mikro:

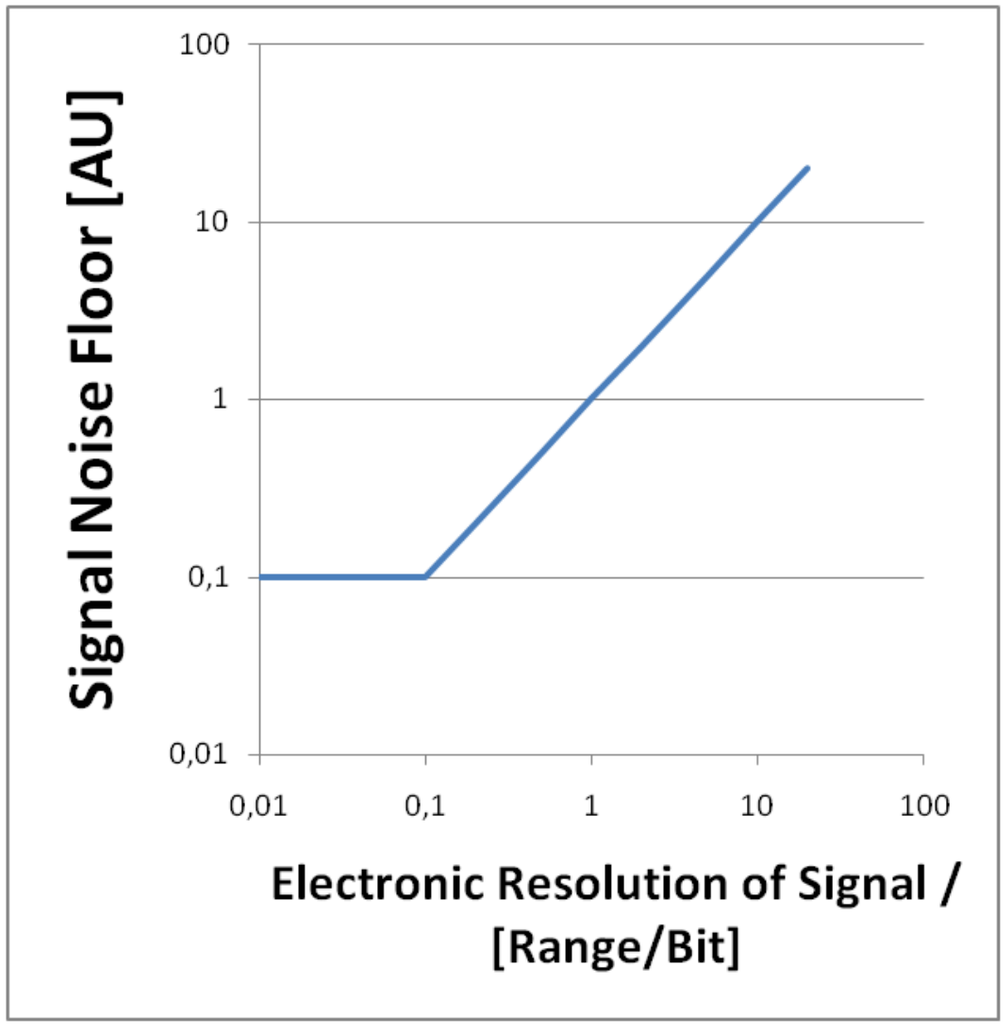
$$F < 2\ N;\ h > 0{,}02\ um$$

Nano:

$$h < 0{,}02\ um$$

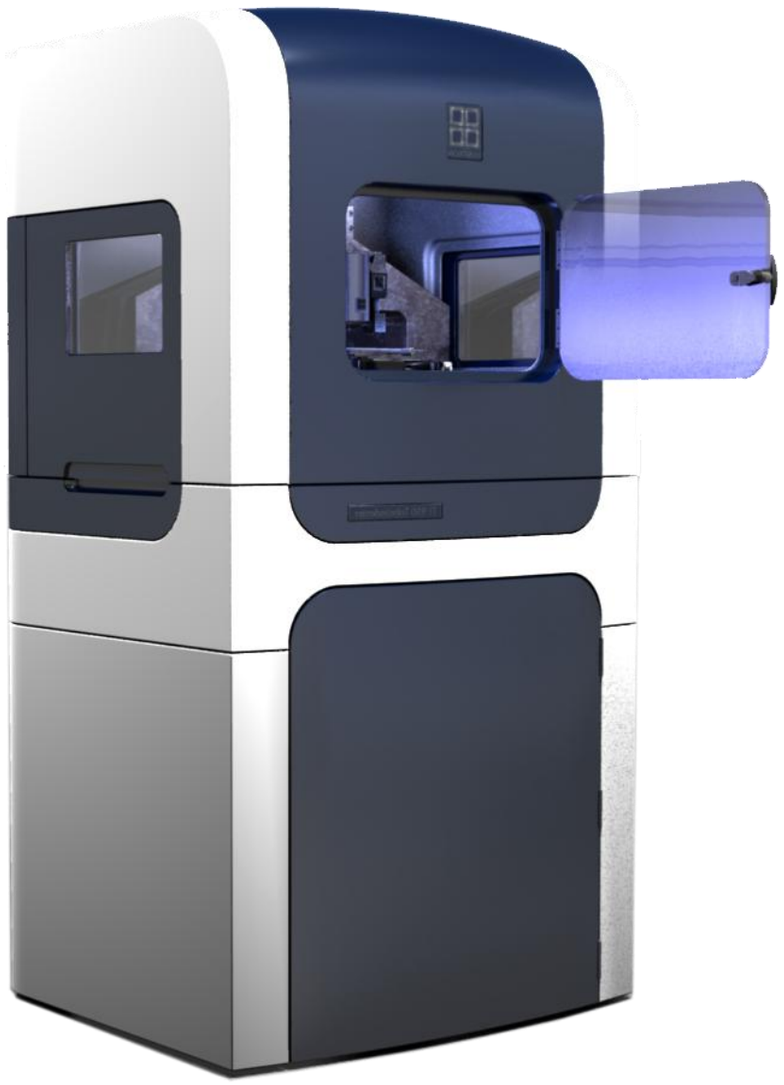
Na podstawie ISO 14577

Nanoindentacja



Nanoindentacja

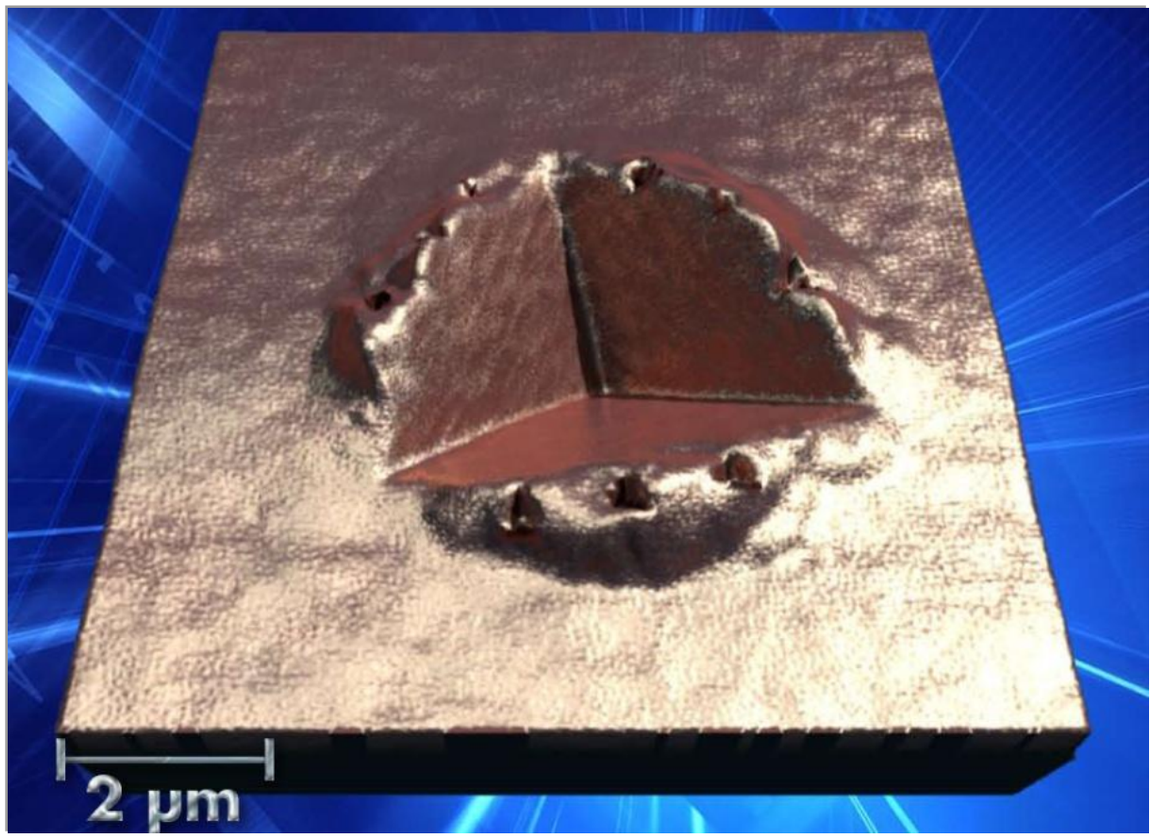
TI 950



- Noise floor < 30 nN
- Noise floor < 0.2 nm
- In-situ SPM
- Dokładność 10 nm
- Pomiary ilościowe
- Pełna automatyzacja

Nanoindentacja

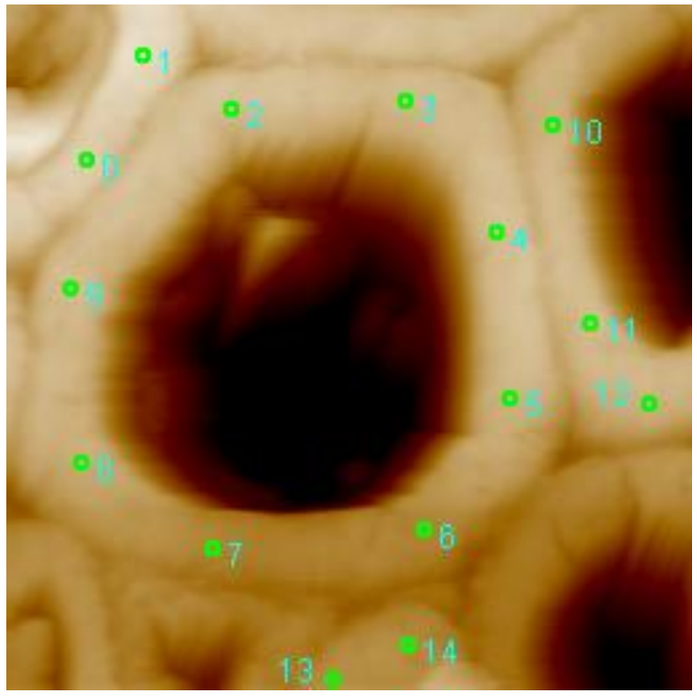
TI 950

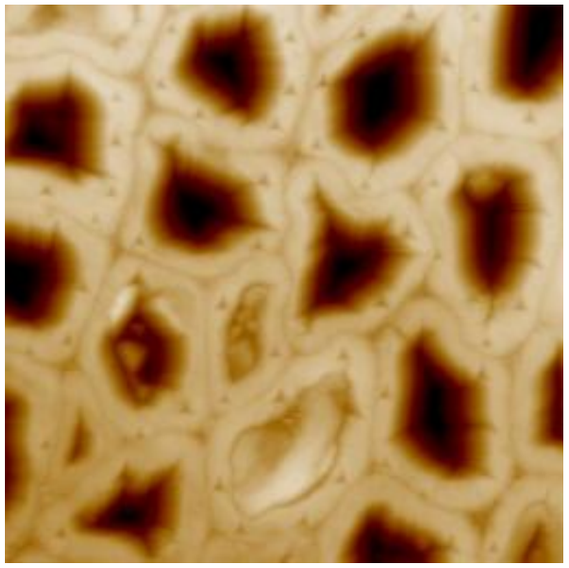


Nanoindentacja wykonana na materiale wypchniętym przez mikroindentację.
Obraz in-situ SPM wykonany tą samą sondą, którą wykonano indentację.

Nanoindentacja

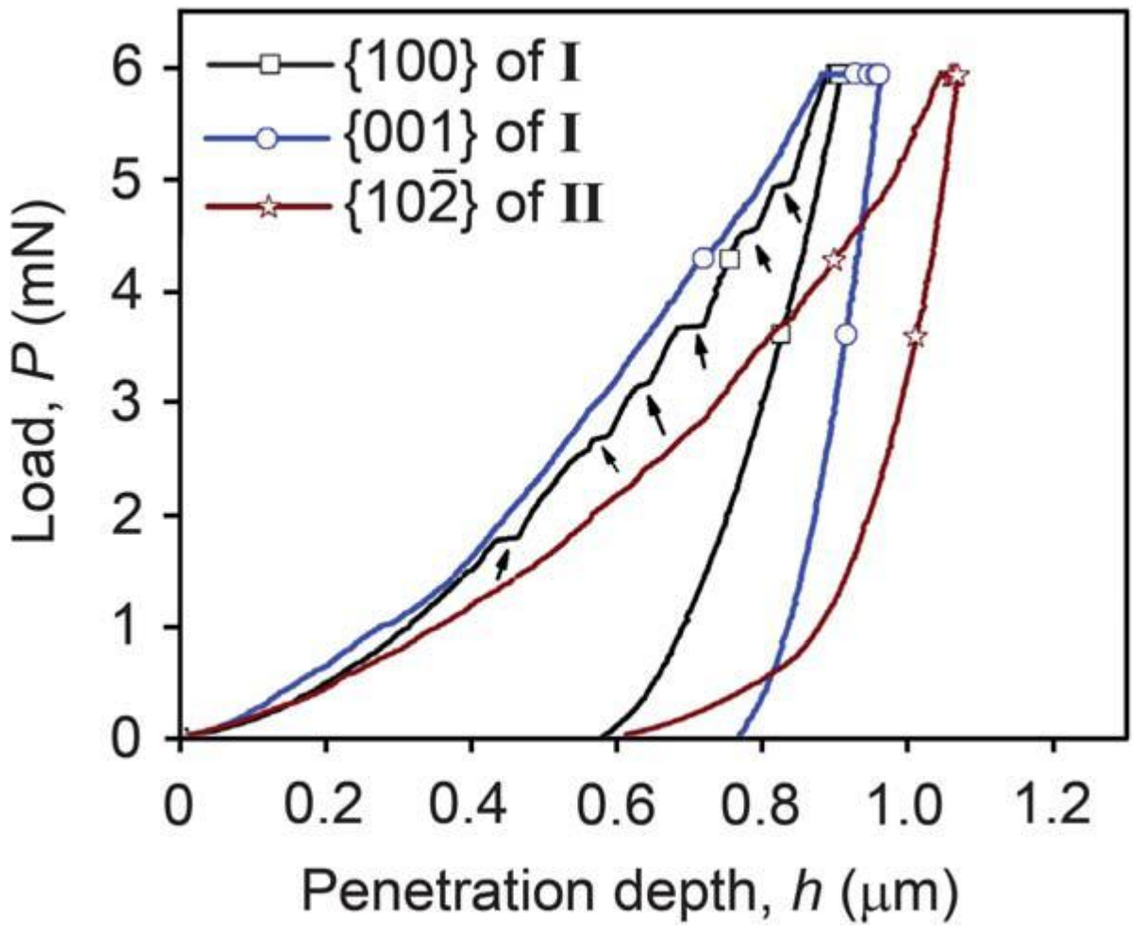
TI 950





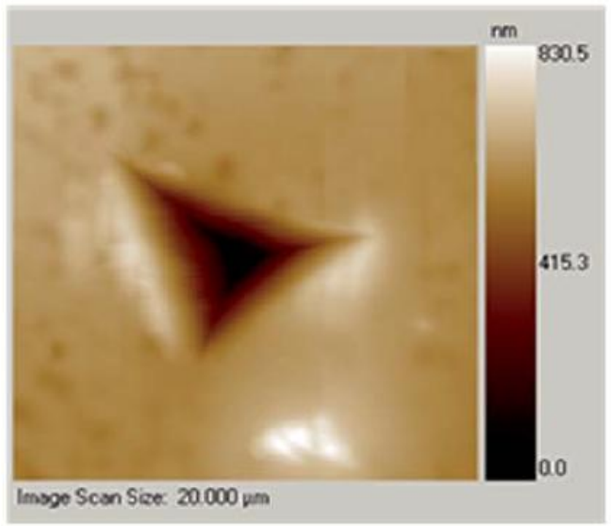
Przykłady automatyzacji indentacji: matryca indentów, wybór miejsc indentacji na obrazie in-situ SPM, obraz topografii wykonany indenterem po zakończeniu indentacji.

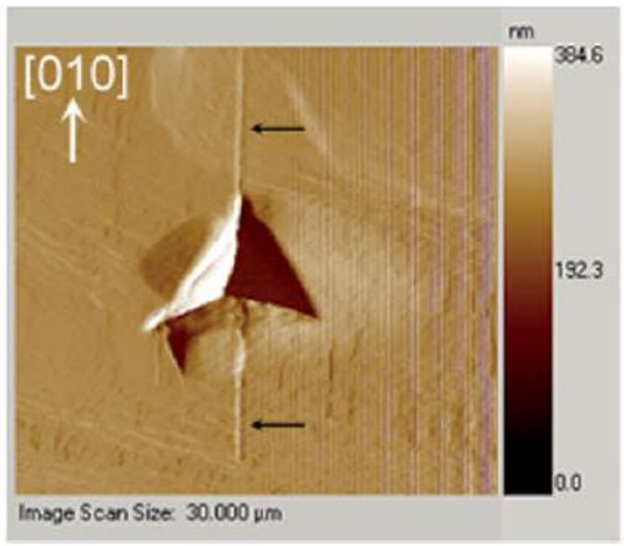
Nanoindentacja

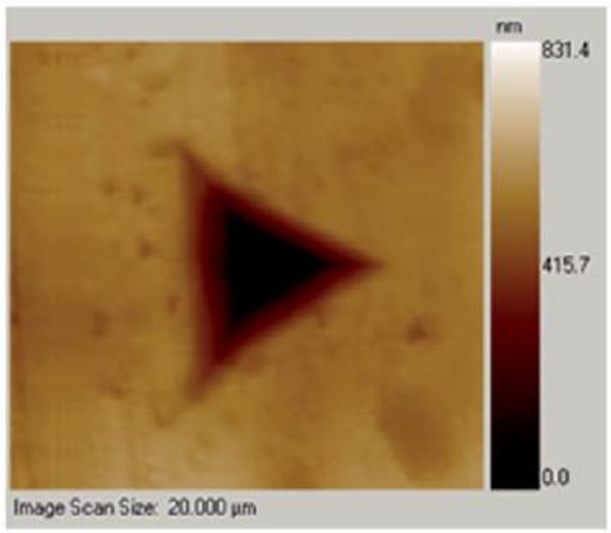


Rozpoznawanie struktury krystalicznej materiałów polimorficznych.

Nanoindentacja







Interaction anisotropy and shear instability of aspirin polymorphs established by nanoindentation

Sunil Varughese, M. S. R. N. Kiran, Katarzyna A. Solanko, Andrew D. Bond, U. Ramamurty and Gautam R. Desiraju

Chem. Sci., 2011, 2, 2236

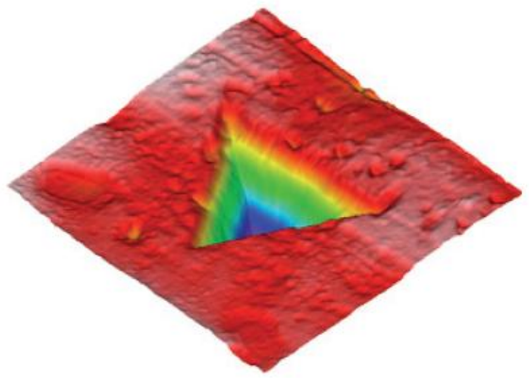
Nanoindentacja

NATURE CHEMISTRY | VOL 3 | NOVEMBER 2011 | www.nature.com/naturechemistry

DRUG POLYMORPHISM

Aspirin headache solved

Chem. Sci. http://dx.doi.org/10.1039/c1sc00430a (2011)



Polymorphism — the existence of different crystal structures of the same compound — is a problem in the pharmaceutical industry, because different polymorphs of the same drug may have different physical properties. Monitoring these subtle differences at each stage of a rigorous production process is a huge expense. Obtaining high-quality crystal structures is not always possible or practical in these circumstances.

Now, Sunil Varughese and colleagues from the Indian Institute of Science and the University of Southern Denmark have used a nanoindentation technique, which can measure the mechanical properties of very small amounts of solids to extremely high precision, to study and differentiate between the different polymorphs of aspirin. Aspirin, although used and studied as a drug for more than a century, has only recently been revealed to have a metastable polymorphic form, known as form II. The structures of the two polymorphs are very similar in two dimensions, and form II has been observed to transform into the more stable form I at ambient conditions.

The different physical properties of the polymorphs — such as elastic modulus and hardness — mean that nanoindentation can be used to differentiate between them, as form II is considerably softer than form I. Varughese and colleagues discovered that what had appeared to be single crystals of form II in fact contained small domains of form I — something that single-crystal diffraction had failed to detect. *NW*

RSC | Advancing the Chemical Sciences

Chemistry World

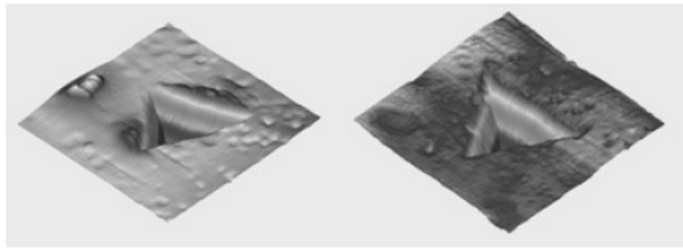
Poking aspirin with a sharp stick

25 August 2011

Scientists from India and Denmark have found a way to go one better than x-ray crystallography to examine pharmaceutical crystals at an even deeper level. Their method could be used to distinguish between polymorphs - different crystal forms - of a compound to aid in drug design.

The team, led by Upadrasta Ramamurty and Gautam Desiraju from the Indian Institute of Science, Bangalore, and Andrew Bond from the University of Southern Denmark, have used nanoindentation to analyse two different polymorphs of aspirin. Polymorphs are crystals of the same compound but with a different molecular arrangement. Although two crystals may appear similar in structure, they can have dramatically different properties, and many drugs only receive regulatory approval for one form. 'One of the current areas of research is trying to link crystal properties to crystal structure and to try to understand how polymorphism occurs,' says Bond.

Attempts to investigate the mechanical properties of crystals using indentation have been limited by the need to grow crystals large enough to analyse. 'The key to using nanoindentation is that we can look at crystals on the scale that we can actually make them,' says Bond. The technique involves depressing a nano-sized tip into the crystal. The researchers then measured the imprint left in the sample to determine the material's mechanical properties, such as plasticity and elasticity (how easily a substance is deformed permanently and non-permanently, respectively).



With nanoindentation, scientists can tell the difference between the two polymorphs of aspirin, which is not possible with x-ray crystallography

The team discovered that two polymorph crystals of aspirin, which appeared to be pure by x-ray crystallography, in fact contained a mixture of the polymorph types. 'What I found most interesting was the idea that the mechanical properties measured by nanoindentation are a very sensitive way of determining polymorphic composition and identifying domains of one polymorph in another, which crystallography can't see,' says Roger Davey who studies polymorphism at the University of Manchester, UK. 'This is indeed of interest to formulators who need pure forms.'

Nanoindentation could have an impact on the pharmaceutical industry, which currently relies on x-ray crystallography to establish whether or not a new drug has been made, for intellectual property rights. 'The long term goal is to develop a firm correlation between nanoindentation responses and crystal structures,' says Bond.

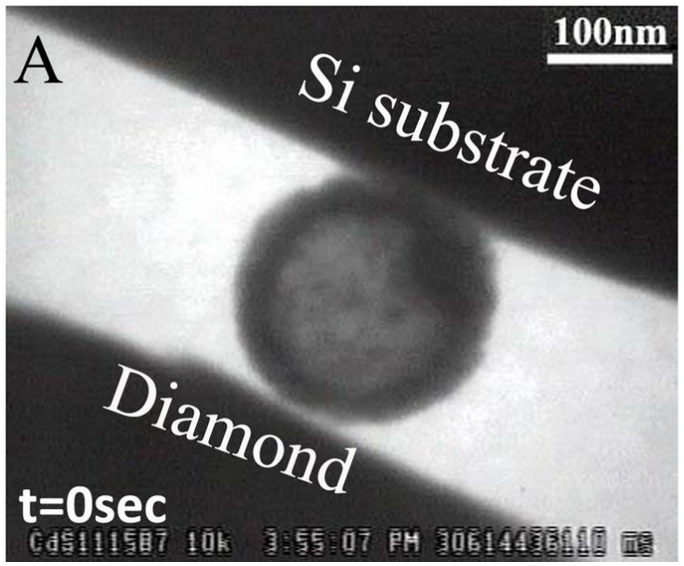
Fiona McKenzie

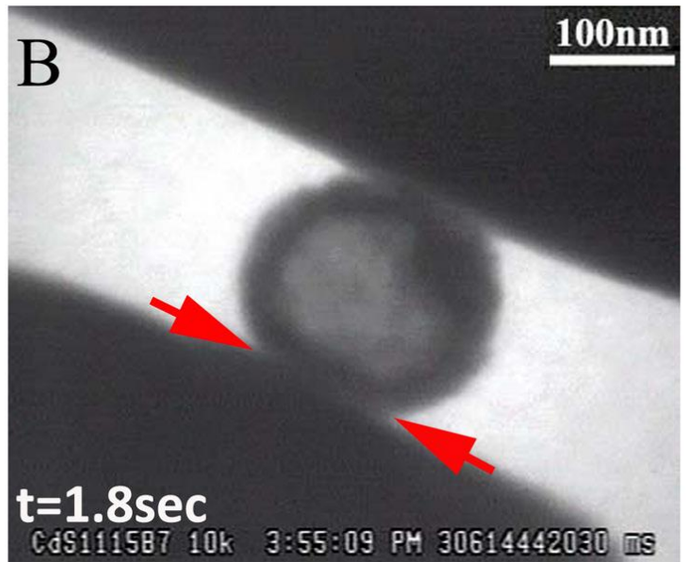
Nanoindentacja

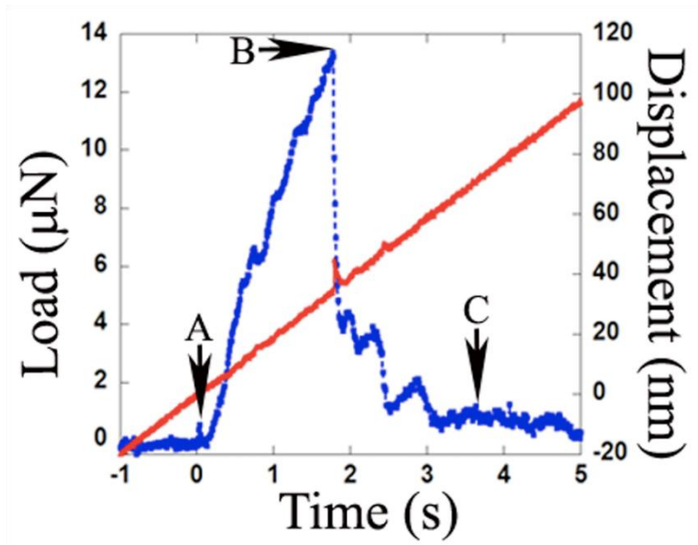
Picoindenter

Nanoindentacja

Picoindenter

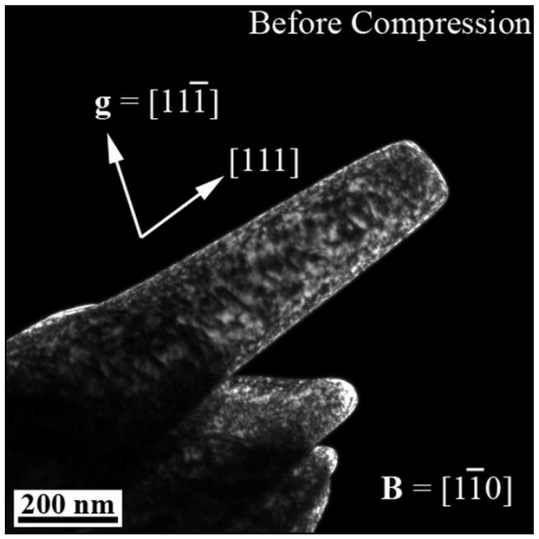


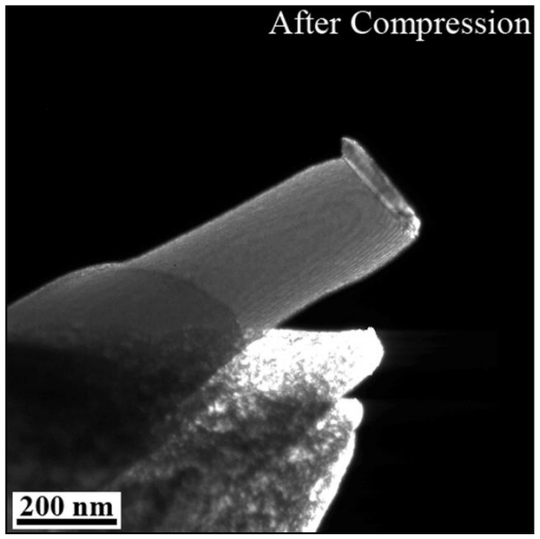


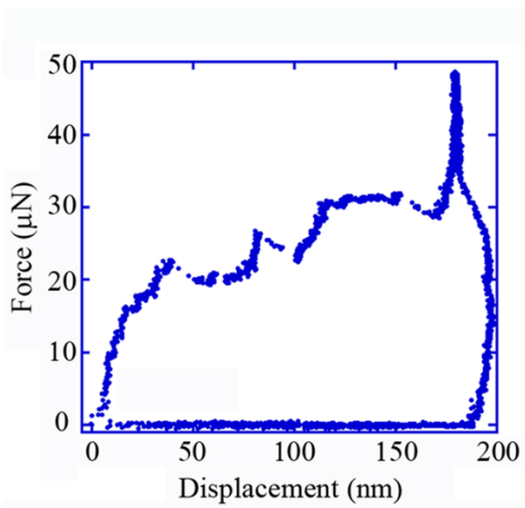


Nanoindentacja

Picoindenter







Z. W. Shan et al., Nature Mater 7, 115 (2008)

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