

**Concern «NANOINDUSTRY» CJSC**

**NANOTECHNOLOGY PRODUCTS AND  
SPECIALIZED EQUIPMENT**

**Catalogue**

**Moscow  
2009**

**Concern "Nanoindustry" CJSC** is an integrating scientific-manufacturing company specialized in the field of practical application of achievements of nanotechnologies and creation of high tech production of nanoproducts which are competitive at the world market.

Self-governing non-profit organization «Institute for Nanotechnologies of International Conversion Foundation» (INAT ICF) created in 1996 is the scientific and production nucleus of the Concern. It is specialized in the field of :

- creating production technologies of metals nanoparticles;
- designing nanocomposite materials and nanostructured coatings;
- increasing wear-out resistivity of materials and metal-cutting tools;
- designing equipment for conducting scientific research works at atomic-molecular level.

### **Products manufactured at Concern:**

- "STRIBOIL" antiwear nanomodificator - a high-performance agent providing increase of lifetime of equipment and various mechanisms as well as saving fuel and energy resources and lubricants.
- AgBion concentrates of silver nanoparticles colloidal solutions.
- "UMKA" nanotechnological complex based on scanning tunnel microscope designed at INAT ICF.
- Scanning tunnel microscope probe sharpening facility.
- «Elf» spectral ellipsometer – device for surface condition and thin surface layers structure characteristics measurement and analysis.
- MTU-1 universal friction machine is intended for conducting friction and wear-out tests of metallic and non-metallic materials at condition of application of various lubricants.

# «STRIBOIL» ANTIWEAR NANOMODIFICATOR

It is used as an additive to lubricating materials for obtaining protective coating during operation. This coating compensates wear-out of details of friction units of mechanisms (internal combustion engines, Diesel engines, compressors, bearings, etc.) during running-in or restoring repair.

## Application areas

MOTOR  
TRANSPORT



ELECTRICALLY  
POWERED  
TRANSPORT



(underground,  
railroad, trams,  
trolley-buses)



MACHINING  
FACILITIES

INDUSTRIAL AND  
POWER  
ENGINEERING  
EQUIPMENT



HOUSING AND  
COMMUNAL  
SERVICES

(pumps,  
compressors)

CONSTRUCTION  
MACHINERY AND  
ENGINEERING



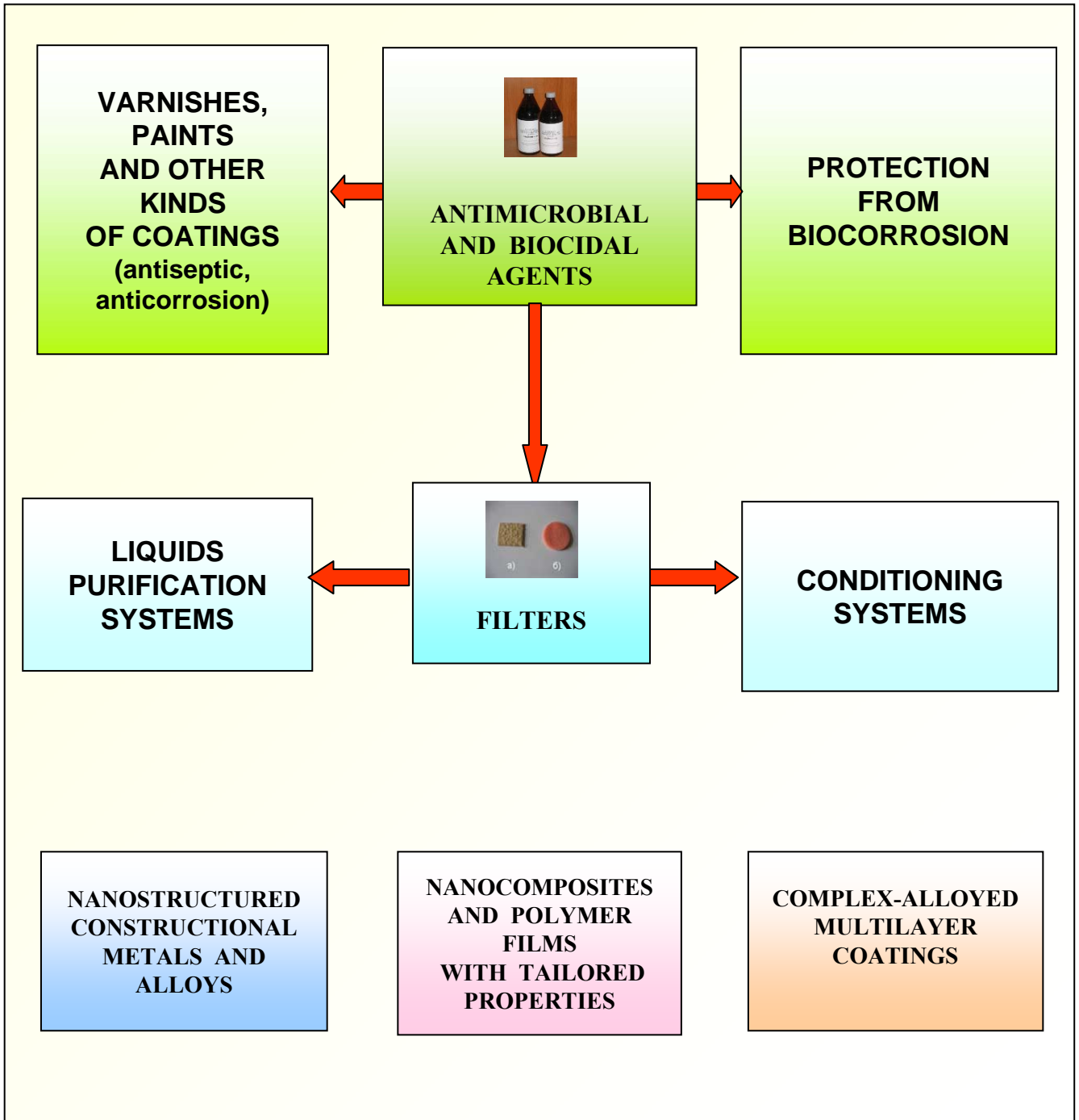
## «STRIBOIL» nanomodificator application advantages

Increase of equipment lifetime and inter-repair life	<b>1,5-2 times</b>
Friction ratio decrease	<b>20-30%</b>
Fuel and electrical energy saving	<b>5-15%</b>
Reduction of noxious gases and soot emission	<b>up to 50%</b>

## “STRIBOIL” nanomodifier application areas

Type of treated equipment	Restored details and units
<p><b>Metal-cutting machines:</b> turning machines, vertical boring mills, face-plate lathes, vertical and horizontal milling machines, boring and coordinate-boring machines, drilling machines</p>	<p>Hydrosystems, spindles, reducers, drives, ball pairs, bearings of all types</p>
<p><b>Grinding equipment:</b> grinding machines of all types, automatic and semi-automatic lines</p>	<p>Hydrosystems, spindles, reducers, drives, sphere pairs, bearings of all types, abrasive disks dressing systems</p>
<p><b>Machines:</b> numerical control machines, automatic lines, processing centers, robotized assembly centers, rotor lines</p>	<p>Hydrosystems, spindles, reducers, drives, sphere pairs, bearings of all types</p>
<p><b>Compressors</b> of all types and models applied in machine building: piston-type, rotor-type, screw-type, plunger-type, membrane-type, etc.</p>	<p>Crank-and-shaft mechanism, lubricators, bearings, high and low pressure pumps, cylinder-piston groups</p>
<p><b>Forge and press equipment:</b> hammers and punches, rolling and roll-straightening mills, blanking equipment, etc.</p>	<p>Screw conveyers and sliding blocks, crank-and-rod mechanisms, rolling and sliding bearings, working surface of shafts, reducers, pumps and compressors</p>
<p><b>Lifting and transport equipment:</b> portal and frame cranes, railway cranes, telfers and beam cranes, transporters and elevators, storage devices</p>	<p>Reducers of all existing models and types, bearings of all types</p>
<p><b>Pumps and fans</b> of all types and purposes</p>	<p>Reducers, bearings of all types</p>
<p><b>Means of transport</b> of all types and purposes</p>	<p>Internal combustion engines, Diesel engines, reducers, gear boxes, bearings of all types</p>

# PROSPECTIVE APPLICATION AREAS of Ag, Cu, Zn, Fe, Co, Pd METALS NANOPARTICLES



# «AgBion» CONCENTRATES OF NANOSCALE SILVER PARTICLES COLLOIDAL SOLUTIONS

«AgBion» concentrates possess bactericidal, virucidal and fungicidal properties. They are active towards mould and blue-green algae.

They are intended for production of disinfection agents, household chemical goods as well as for modification of existing materials and coverings (construction materials, polymers, fabrics, etc.) in order to impart biocidal (including antimicrobial, bactericidal) properties to them.

## Application areas of silver nanoparticles

### 1. New generation chlorine-free high performance biocidal agents used for:



- disinfection of rooms, interior objects, sanitary, technical and other equipment, water, etc.;
- prophylactic sanitary-hygienic treatment of rooms and equipment;
- protection of wood, wooden work-pieces, materials and buildings from rotteness and mould.

### 2. Modification of traditional materials in order to impart biocidal properties to them.

## Application areas of biocidal materials based on silver nanoparticles

- Public catering enterprises
- Child, sports, medical, prophylactic and penal institutions
- Other public places that run elevated infection spread danger

Pools, showers, bathrooms, other public places



Air conditioners  
Water purification



Transport passenger cabins



Restoration and preservation of cultural monuments



# LINE OF NEXT-GENERATION PRODUCTS

## BASED ON "AgBion" COLLOIDAL SOLUTIONS OF SILVER NANOPARTICLES

### Household chemical goods

**Disinfecting silver solution AgBion** (500 ml, 1000 ml volume ).

Application: moist cleaning of rooms, disinfection of surfaces at work and at home by wiping (furniture, including kitchen furniture, gas and electric stoves, office equipment). Agent can be used in social service institutions, housing, communal and other services (consumer markets, communal objects, hotels, hostels, pools, bathrooms, saunas, barber's shops, beauty shops, other public places), at food trade and public catering enterprises and in child institutions.

**Biocidal spray** for public accommodation sanitary-hygienic treatment .

**AgBion deodorant-spray** for shoes (150 ml volume with diffuser).

Application: shoes treatment, feet deodorant. It prevents initiation of unpleasant smell, freshens, protects feet from fungi diseases.

**Humid napkins AgBion** (tissue paper soaked in silver nanoparticles solution).

Application: moist cleaning and disinfection.

**Biocidal washing agent** (500 ml, 1000 ml volume ).

Application: as an additive to washing agents for disinfection. It imparts biocidal properties to linen.

**Biocidal additive to washing and cleaning agents.**

Disinfecting silver solution **AgBion - Spray** (100-200 ml volume with diffuser).

Application: disinfection of household utensils (table surface, consumer electronics, office equipment, PC, personal hygiene utensils).

### Biocidal varnishes, paints, coverings, construction materials

**Biocidal paints based on water for finishing of interiors of rooms.**

**Biocidal paints based on organic solvents for finishing of interiors of rooms.**

**Biocidal powder paints** for metallic surfaces (cabinets, shelves, equipment housings), accessories (door handles, handrails, etc).

**Biocidal primer.**

**Biocidal varnishes for furniture, etc.**

**AgБион Antimould** – agent for extermination and prophylactic of mould, fungi, algae, blueing and other microorganisms on wooden, concrete, brick and any other surfaces with soak ability.

**AgБион Construction** – biocidal additive used in production of construction materials (concrete, construction blocks based on cement, gypsum, epoxy composites). It imparts anti-fungi and antibacterial properties to construction materials.

**AgБион Anticor** – agent for protection from corrosion and formation of biofouling of metallic surfaces. It is applied for treatment of carrying metallic constructions, water supply systems, bottoms of vessels, etc.

## Filters

**Water filters.**

**Filters for food industry** (brewing industry, production of juices, alcohol-free drinks).

**Air filters of ventilation and conditioning systems** (in buildings, cars, etc.)

## Packing, dishes

**Packing materials for food products extending their shelf life.**

**Disposable and non-expendable dishes and place settings with surface bactericidal properties.**

**Food containers.**

**Food trays of refrigerator chambers and showcases.**

## Medical goods

**Bactericidal plasters.**

**Bactericidal dressings.**

**Bactericidal anti-fungi ointments.**

**Bactericidal hand gels.**

## Products for agriculture

**Biocidal rubber details of milking machines**

(nipple rubber, couplings, etc.).

**Biocidal agent against hoof rotteness**

(for cattle baths on the way to standing boxes).

## Other products

**Non-expendable tablets for water disinfection** based on water-absorbing swelling polymers and silver nanoparticles.

**Damp napkins for personal hygiene** containing silver nanoparticles.

**Biocidal transparent varnish for office equipment** (computer keyboards, mice, phone buttons and housings, etc.).

**Biocidal fabrics for working clothes of employees of medical institutions and agricultural enterprises.**



# «UMKA» NANOTECHNOLOGICAL COMPLEX

**Purpose:** It is intended for surface studies and carrying out a variety of laboratory and research works in the field of nanotechnology, physics, chemistry, biology, genetics, etc. as well as for personnel training in the field of works at atomic-molecular level.

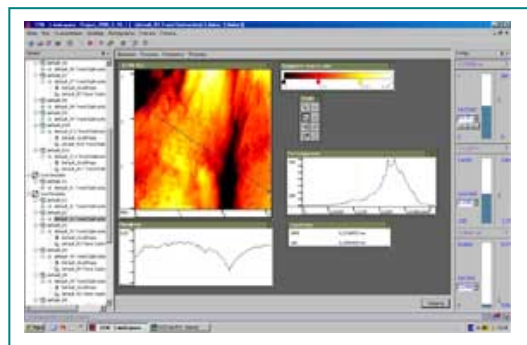


An example of scanning a microcrack on nickel surface (scan area  $2 \times 2 \mu\text{m}$ )



## Technical parameters

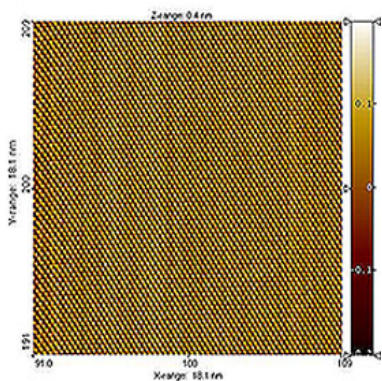
X- and Y-axes resolution, nm	0,02
Z-axis resolution, nm	0,01
Minimal scanning pitch, Å	1



## Main application areas of «UMKA» complex

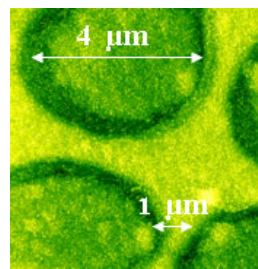
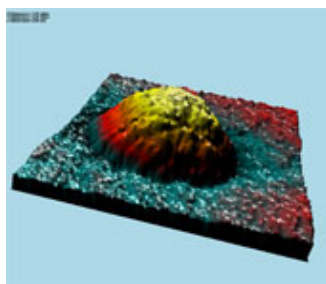
Fulfillment of research, development, applied and technological works at micro- and nanolevel

- Determination of characteristics of materials and media at atomic-molecular level and their analysis
- Condition control of coverings and surfaces of details being processed
- Express-analysis in medical laboratories
- Research and determination of characteristics of conductive surfaces



Atomic lattice of pyrolytic graphite

Graphite film growth island on gold surface  
(X, Y dimensions:  $2,2 \mu\text{m}$ ;  
Z dimension:  $0,86 \text{ nm}$ )

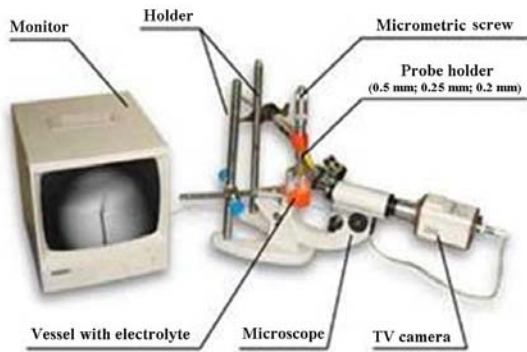


Test cell on silicon for STM calibration along X, Y and Z axes

# TUNNEL MICROSCOPE PROBE SHARPENING FACILITY

**Purpose:** manufacturing probes used in tunnel microscopes for surface studies of materials samples at atomic-molecular level.

## Technical parameters

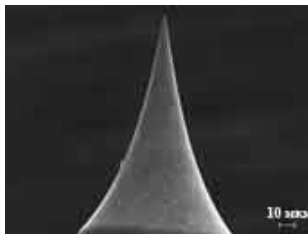


Diameter of probe to be sharpened, mm	0,2	0,25	0,5
Sharpening time, min.	4	6	30
Sharpened probe radius, nm	up to 100		

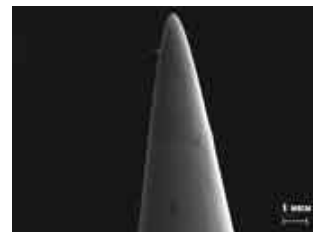
## Facility advantages:

- Possibility to sharpen probes made of work pieces of various diameters
- Current switch-off remote control
- It does not require high-qualified personnel

Probe image  
at 10  $\mu\text{m}$  scale



Probe image  
at 10  $\mu\text{m}$  scale

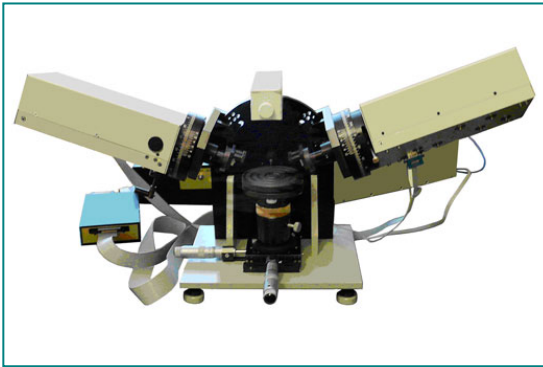


# «ELF» SPECTRAL ELLIPSOMETER – - an instrument for technological control at nanoscale level

## Purpose:

- Measurement of thickness of thin films and multilayer film structures
- Measurement of optical constants spectra and dielectric properties of materials
- Analysis of surface condition and structure of thin surface layers

## Technical parameters



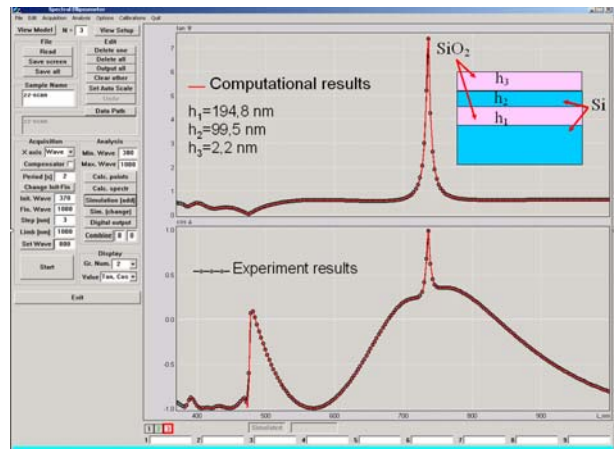
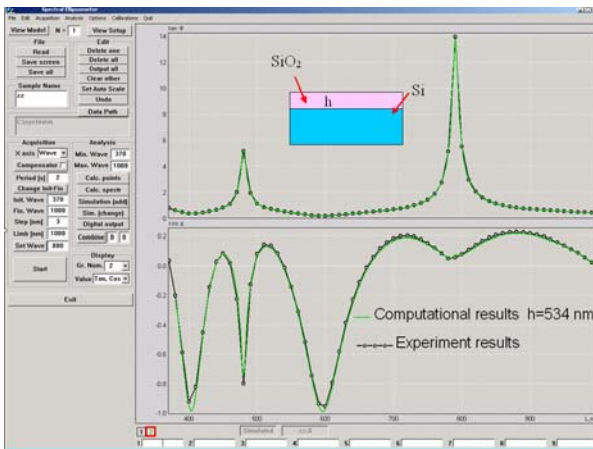
The device supports spatial mapping of any measured characteristic.

Availability of reference photodetector allows to conduct photometric measurements.

Wavelength range	380 – 1000 nm
Spectral resolution	4 nm and better
Repeatability	0,005 <sup>0</sup> and 0,01 <sup>0</sup> for ellipsometric angles $\psi$ и $\Delta$ respectively
Accuracy	Thickness: 0,1 nm* and better; refraction index: 0,005*
Incidence angle	45 <sup>0</sup> – 90 <sup>0</sup> at pitch of 5 <sup>0</sup>
Thickness range	0,1 nm – 2 $\mu$ m*
Light beam diameter	2 mm (0,2 mm using micro add-on)
Spectrum measurement time	Minimal: 30 sec; recommended: 1-2 min

\*Values are given for test system SiO<sub>2</sub>/Si

## Examples of ellipsometric research of thin film structures



# UNIVERSAL FRICTION MACHINE MTU-01

**PURPOSE:** for conducting friction and wear-out tests of metallic and non-metallic materials at conditions of application of various lubricating materials (oils and plastic lubricants).

## **APPLICATION AREA**

Friction machine MTU-01 allows to determine and control tribotechnical characteristics of various materials and lubricating compositions. It can be used in conducting research works for determination of optimal compositions of materials and lubricating compositions for the purpose of enhancing wear-out stability of various units of machines and mechanisms as well as for training and conducting laboratory works in the field of tribotechnics.



MTU-1 is simple and user-friendly. It does not require user's high qualification and is recommended for application in laboratories of industrial enterprises.

## **Technical parameters**

Nominal voltage	220 V
Current frequency	50 Hz
Voltage supply current mode	alternating, single-phase
Power consumption	up to 0,6 kW
Sample rotation speed without load	up to 3000 rpm
Tested samples pressing effort	50 to 800 N
Weight	up to 50 kg

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