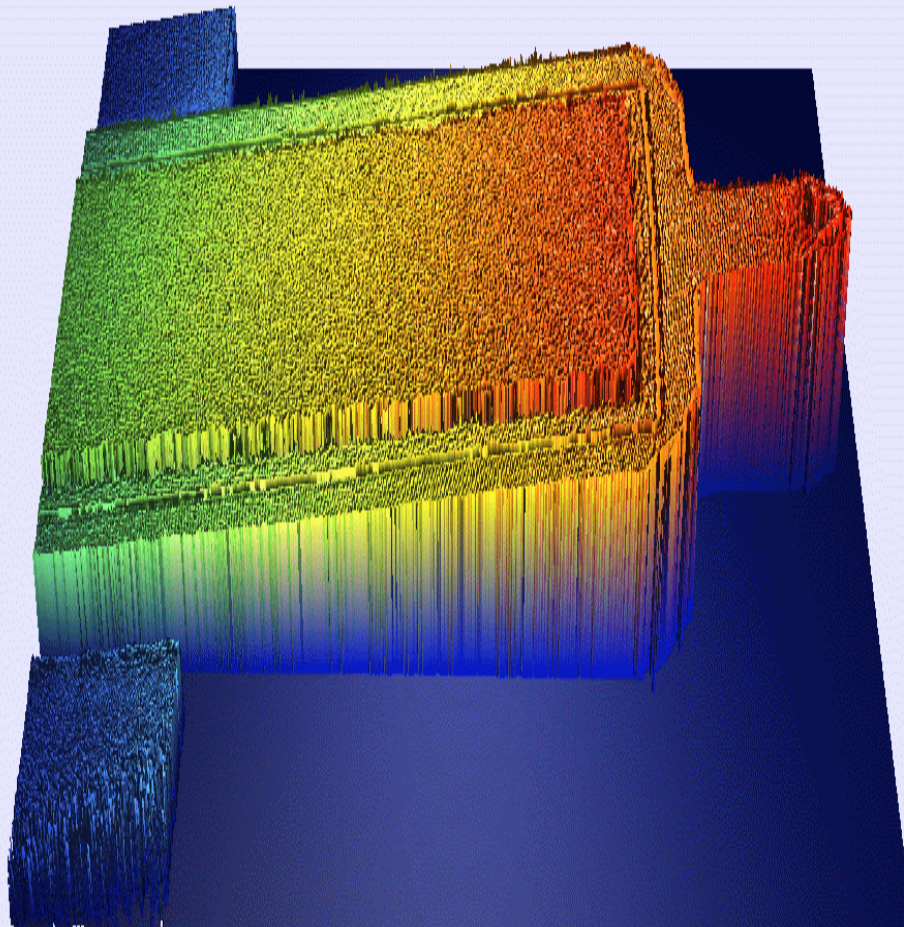


Bulletin of Micro and Nanoelectrotehnologies

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Department of Micro and Nanoelectrotechnologies

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INCDIE ICPE CA***

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Journal Scope

This publication has several objectives:

- The promotion of results and scientific approaches in the Department of Micro and Nanoelectrotehnologies (Dep. MNE).
- The publication of original works of the researchers of MNE Department of INCDIE ICPE - CA, especially of junior researchers.
- Up to date information in the field of MEMS.
- A gateway to collaboration with any scientific group related to the field
- We hope that the publication will contribute to a better knowledge of the INCDIE ICPE CA activities in general.
- In the first number we present the strategy and the structure of MNE department and we announce the calendar of the scientific events in which MNE department is involved,
- In the future number this publication will include :
 - Regular papers
 - Short papers
 - News
 - Letters for editor

Dr. Eng. Mircea Ignat, Head of MNE Dep.

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FOREWARD

Our institute has a long history. During the period of 60 years our roots in the field of electrical engineering are 40 years old- our laboratories has collected an enormous amount of professional skills, mainly in the field of electrical machines, materials for electrical engineering, in vibration sciences and not at the last in the field of active corrosion protection.

Done by the priorities of our days- energy saving, sustainable development of the society as a whole, health and biological sciences - our institute suffered in this year a reorganization process through which the main scientific capacity is focused on micro and mono-nanosystems, energy saving and on so called energy materials.

Our achievements in actuation systems, ready to be used in microelectromechanical systems, have a history of more then 10 years and are now integrated in the new department of micro- and nanotechnologies. This department plays a very important role in the new landscape of our organization. It will be the new connection of our scientific –technological results and the society, covering the needs of the knowledge- based economy for small and very small components with at least the same functions as the old generation of transducers has, generators, motors, but only with a very limited consumption of energy and material resources.

Our new electronic journal will give the advice for that new direction, playing in the same time a catalyst role in this special world of small and very small things.

Congratulations to our colleagues for starting the first electronic journal for micro- and nanoelectrotechnologies and for the journal we wish it a long life and a huge role in promoting through our policy the whole field of micro- and nanoelectrotechnologies.

GENERAL MANAGER OF INCDIE ICPE CA
Prof. dr. phys. Wilhelm Kappel

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MNE DEPARTMENT STRATEGY

RESEARCH AREAS

- ✚ Electromechanical Components: linear piezoelectric multilayer microactuators, magnetostrictive microactuators, electrothermal microactuators, electrochemical microactuators, micro piezoelectric rotary motors.
- ✚ Sensors: Inductive displacement sensors for monitoring landslides, micro piezoelectric vibration, micro-electromechanical power generators (harvesting).
- ✚ Gas sensors (CO, CO₂, NO_x, H).
- ✚ Microsystems for magnetic multilayer with effect of giant magnetoresistance (GMR) and spin-dependent tunneling (TMR) for spintronics.
- ✚ Carbon nanoparticles and porous carbon designed for different industrial applications(water treatment/water purification/water desalination, biofilters, biotechnologies, catalysis, energy(e.g. supercapacitors))
- ✚ Electron beam hardening and mechanical layer deposition.
- ✚ Electrical Applications of superconductors.
- ✚ Investigation and control raceway rail industry.

TECHNOLOGICAL AREAS

SDV design, models and prototypes for research projects.

Execution of processing mechanical systems.

FIELD SERVICES

Investigations and experiments with static and dynamic photogrammetry systems.

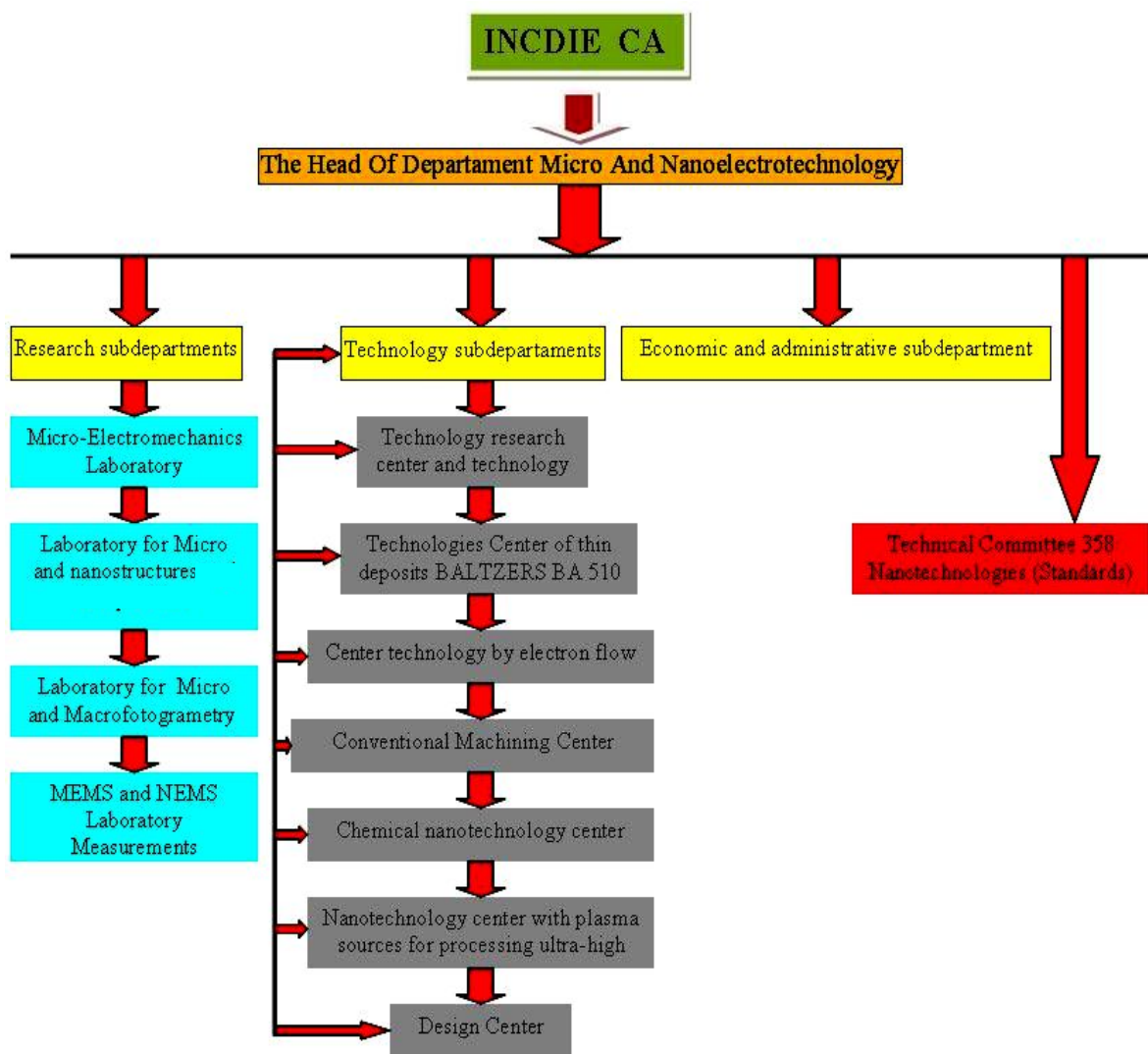
Specific measurements of MEMS and NEMS with microscope VEECO NT 1100 and interferometry system AGILENT.

MEMS and NEMS for courses on university curricula.

***Principles, Directions for CDI,
Results Revaluation for MNE department***

- Priority principles of supply management:
 - Increase (enrichment of) the basic knowledge of the areas researchers MEMS, NEMS and related technologies.
 - Reaching an European scientific visibility
 - A sustained involvement in collaborative European projects.
- Ensure regular evaluation to determine objective scientific hierarchy.
- Economic independence regarding the national scientific system management
- Collaboration with other Departments in the new structure of INCDIE CA.
- Initiation of MEMS and NEMS applications concerning the field of medical engineering and bioengineering.
- Open for applications in aerospace domain and special equipment.
- Assuring the secretary activity of MNE Department in CT 378 ASRO (Nanotechnology)
- Products of research projects (of national programs and projects resulting from direct), to become an object of the microproduction in the MNE Department.
- The emergence of project know-how.
- Publication of scientific works in journals of impact (ISI) in the idea that visibility will attract scientific support for of an economic recovery and improvement of grants ongoing.

STRUCTURAL CHART OF DEPARTMENT MICRO AND NANO ELECTROTECHNOLOGY



Managerial Structure of MNE

- Head - Dr. Eng. Mircea IGNAT
- Head Assistant – Dr. Eng. Gabriela HRISTEA

- **SCIENTIFIC COUNCIL**
- Dr. Fiz. Jenica NEAMTU - Senior Researcher
- Dr. Eng. Gabriela HRISTEA - Senior Researcher
- Dr. Eng. Mircea IGNAT - Senior Researcher
- Secretary – Dr. Eng. Teodora MALAERU – Senior Researcher

- **ADMINISTRATION COUNCIL**
- Dr. Eng. Mircea IGNAT
- Dr. Fiz. Jenica NEAMTU
- Eng. Iuliu POPOVICI

PhD. Topics in MNE Department

Piezoelectric Micromotors Designed for Non-conventional Drive Systems

Eng. George Zarnescu

Coordination: Prof. Aurelian Craciunescu *UPB, dep. of Electrical Drives and Machines*

This paper describes an experimental and theoretical approach on a rotary piezoelectric motor with tubular geometry.

The working principle of this piezoelectric motor can be explained in single phase supply by Rayleigh surface waves motion. The elliptical waves are produced at stator-rotor contact surface when a tubular piezoceramic element which is excited by a sinusoidal voltage at resonant frequency. The rotor is forced to move by friction forces in the opposite traveling wave direction. This type of ultrasonic micromotor has the advantage of a simple manufacturing technology, compactness, large axial force support at low angular speed and a good (movement) precision and control. The two major disadvantages consist in the reliability for long period operations due to friction phenomena and the need (necessity) for an ultrasonic frequency power supply with at least 25 V peak voltage.

Theoretical aspects are (Theory is) developed starting from the basic piezoelectric equations of direct and inverse piezoelectric effect written in tensorial form and the differential equations of inner radial and circumferential mechanical stresses and deformations. Then, these equations are combined in one modeling type and 3D simulations of mechanical movement to give a complete description of the entire electromechanical interaction.

Final sections are focused on the driving methods, electromechanical characteristics and micromotors performances. The influence of frequency and axial forces on motors performances is compared both theoretically and experimentally.

It is concluded that angular speed is most sensible to frequency. This is the basic method of speed regulation for an ultrasonic piezoelectric motor. The driving scheme is the most complex being necessary an over 50 V voltage with ultrasonic frequency source.

Axial force variation determines directly the contact pressure modification between cylindrical stator and tronconical rotor and consequently change the angular speed. The characteristic is

similar with speed function of frequency. Also, the optimum measured axial force was measured.

- There has been performed two bidimensional simulations in COMSOL and two 3D simulations to validate the theoretical model and to compare it with experimental results.
- Finale. is presented a very accurate method of resonance modes identification by laser interferometer. Resonance is identified by the maximum displacement obtained when tubular stator is excited by the power supply.
- Modeling electromechanical scheme is also utile especially for resonance phenomenon analysis. Electromechanical impedance is characterized for the entire frequency spectrum but especially in the resonance zone. From impedance it can be further calculated other parameters like current, angular speed and maximum loading torque.
- Electrical losses were also calculated in order to determine the efficiency of piezoelectric motor.

CHRONICLE, SCIENTIFIC EVENTS

2010 Agenda

18th November 2010 – INGIMED –round table under the frame of INCDIE ICPE - CA and Romanian Federation of the Biomedical Engineering (president Prof. Radu Negoescu);

topics:

- o Tendencies in the field of the biomedical engineering.
- o Biomedical engineering and how specialists are trained by experts in technical universities
- o The scientific and technological approaches regarding MEMS and NEMS
In biomedical engineering in INCDIE ICPE - CA research plan

25th November 2010 – workshop: **Nanotechnology Standardization Development** –organized by CT 378 ASRO:

topics:

1. Standardization in the field of nanotechnologies;
2. New approaches regarding standardization in nanoscience
3. Technical Committee 378 activities plan
4. National and International standardization: implications and involvement

2011 Calendar

Scientific Events MNE Department

- 26-27 May, **MEMS and NEMS Symposium of junior researchers (I)** Bucharest, INCDIE CA

Topics:

- o Unconventional microelectromechanical drivers, micromotors, microactuators.
- o Micro and Nanoelectromechanical generators and harvestings.
- o Micro and Nanoelectromechanical Sensors.
- o Specific Micro and Nanoelectrotehnologies.
- o Tendencies and policies in MEMS and NEMS.

Important dates :

- | | |
|------------------------------------------|-----------|
| - Abstracts Submission Deadline(2 pages) | March 4 . |
| - Author notification: | April 8. |
| - Final Full Paper Submission (6 pages): | April 22. |
| - Final program : | May 9. |

- June 9-10, **Workshop of MNE Dep. Strategy, Politics, Mentality, Outlook.** (I) Gradistea – Brasov.
- October 21, **Measuring in MEMS and NEMS Seminary.**
- November 25, **MEMS and NEMS in INGIMED field** (*specific topic of the XII the INGIMED Conference*).

Important dates:

- | | |
|-------------------------------------------|---------------|
| - Abstracts Submission Deadline (2 pages) | July 4 . |
| - Author notification: | September 30. |
| - Final Full Paper Submission (6 pages): | October 14. |
| - Final program: | November. |

Acquisitions/2010:

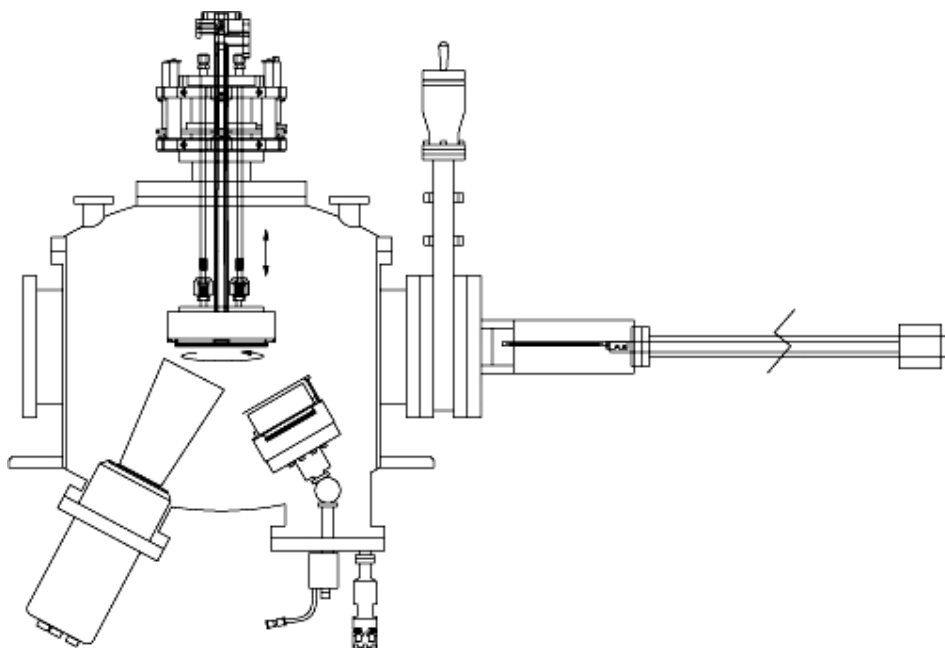
This year, the MNE department was equipped with an **ATC2200 AJA sputtering** system

This equipment is described in general terms in the following:



Fig. 1. A multi-technique deposition systems

ATC 2200 IBAD with (3) A340-XP 4" UHV sputter sources with in-situ tilt, a COPRA ICP plasma/ion source for ion beam assisted deposition below 5×10^{-4} Torr, 800°C rotating substrate heater with RF bias and motorized Z motion and a load-lock for 6" diameter substrates



The AJA International, Inc. ATC Series Thin Film Deposition Systems are versatile coating tools that can be built in a wide variety of configurations to satisfy almost any requirement. These systems are built around AJA's unique A300-XP (UHV) or Stiletto Series (HV) magnetron sputtering sources which feature in-situ source head tilting allowing precise and repeatable con-focal, direct, and off-axis deposition. Larger systems are fitted with a heavy duty hydraulic hoist to lift the chamber top for system access - the chamber top swings to either side at the top of the hoist's stroke. Medium and small ATC systems feature a hinged top with gas shock assist mechanism for easy chamber access.

Substrate holders from 1" to 10" diameter are available with heating to 1000°C and/or substrate cooling from ambient to LN 2 temperatures. AJA magnetron sputter sources from 1" diameter to 12" diameter plus rectangular and triangular versions can be incorporated.

These multi-technique deposition systems can be also fitted with electron beam evaporation, thermal evaporation, Knudsen cells, PLD, ion sources for IBAD, facing target sputtering sources (FTS), contact masking systems, glove boxes, auto-loading cassette systems, RHEED, Auger analysis, and RGA's.

NANOMARKET- economic issues

Nanomaterials of all types are poised to register robust growth driven by growing interest from healthcare and electronics sectors. Oxides and metals are expected to capture a major share of global NanoMaterial revenues in the short-term. Emerging NanoMaterials such as single-wall nanotubes, and dendrimers are forecast to contribute significantly to market growth. In terms of

end-use segments, healthcare and electronics dominate worldwide revenues for NanoMaterials. Also, exceptional growth is anticipated from end-use markets such as construction. Commercial usage of NanoMaterials is limited to few applications such as sunscreen lotions, wafer polishing, and treatment of textile

United States emerged as the largest regional market with an estimated **US\$1.12 billion** revenues in 2008, as stated by Global Industry Analysts, Inc. Western Europe is the second largest regional market accounting for over 30% of global revenues. Asia-Pacific is projected to be the fastest growing market, with revenues poised to increase at a compounded annual rate of 38.7% over the analysis period 2002-2015. Worldwide NanoMaterial oxide revenues are forecast to reach US\$6 billion in 2013. Revenues for nano-metals are projected to approach **US\$3 billion** by 2015. Carbon Nanotubes is another billion-dollar segment expected to post double-digit growth through 2015. Electronics is the largest end-use market for NanoMaterials while healthcare is the most promising.

Key players in the nanomaterial space include *AMAG Pharmaceuticals Inc., Advanced Nano Products Company Limited, Antaria Limited, Altair Nanotechnologies Inc., Apex NanoMaterials, ApNano Materials, Catalytic Materials, Dendritic Nanotechnologies Inc., eSpin Technologies Inc., Hyperion Catalysis International, ILJIN Nanotech Co Ltd., Integran Technologies Inc., Nanodynamics Inc., Nanoledge, Nanophase Technologies, Oxonica Plc., Shenzhen Nanotech Port Co Ltd., Sun Nanotech Company Limited and Xintek Inc.*

"NanoMaterials: A Global Strategic Business Report" published by Global Industry Analysts, Inc., analyzes the global market with hard-to-find data and analytics for key **regional markets** such as the United States, Japan and Western Europe, alongside up and coming markets such as Asia-Pacific. The report provides a comprehensive review of market trends and issues, drivers, business profile, players, competitive landscape, recent developments, mergers, acquisitions, alliances, product launches and other strategic industry activities. Analytical estimates and projections are presented in terms of annual sales in US\$ over the years 2002 through 2015. Product segments independently analyzed include Oxides, Metals, Carbon Nanotubes, Clays, and Others (Nanominerals, Nanocrystalline Materials, Nanowires, Quantum Dots, Dendrimers, and Polymer Nanocomposites). End-use sectors analyzed in the report include Electronics, Health Care, Construction, and Others (Aerospace & Defense, Automobiles, Cutting Tools, and Energy).

NANOPOROUS MATERIALS

[GIA](#) announces the release of a comprehensive global report on [Nanoporous/Microporous Materials market](#). Stringent environmental regulations and improved living standards have placed nanoporous materials under the spotlight. Nanoporous materials, with well-controlled, evenly distributed pore structure, have high surface to volume ratio, large porosity and high surface area. Owing to these unique features, nanoporous materials have made tremendous impact on several industries such as petroleum and gas, microelectronics, clean energy, medicine, environment, agriculture, and manufacturing.

Nanoporous Materials, characterized by unique structural, bulk and surface properties, find applications in varied fields such as biological molecular isolation, catalysis, separation, purification, ion exchange and sensors. Zeolite constitutes the largest segment in the worldwide market for nanoporous materials. With widespread applications ranging from high-end catalysts in petroleum and chemical industry to detergents, the segment is expected to retain its dominance over the long term too. Activated carbon, another important nanoporous material, is widely used in

controlling emissions from motor vehicles. However, in terms of growth, Activated Alumina and Silica Gel is expected to emerge as the fastest growing segments over the period 2006 and 2015.

Petroleum and gas refining is the largest end-use market for nanoporous materials. Environmental applications represent a potential market with great opportunities. Nanoporous materials are ideal for a wide array of applications, such as odor control, air pollution control, radioactive waste treatment, and solvent recovery. The use of nanoporous materials in environmental applications is expected to witness the fastest growth over the coming years.

The global marketplace is characterized by participants such as *Albemarle Corp.*, *Alcan Inc.*, *AMCOL International Corp.*, *American Colloid Company*, *Nanocor, Inc.*, *Axens*, *BASF Catalysts LLC*, *Bentonite Performance Minerals LLC*, *Calgon Carbon Corp.*, *CECA Specialty Chemicals*, *ExxonMobil Chemical*, *Kuraray Chemical Co., Ltd.*, *MeadWestvaco Corp.*, *NanoPore, Inc.*, *NanoScape*, *Norit N.V*, *Oil-Dri Corp. of America*, *PICA*, *Porocel Corp.*, *PQ Corp.*, *ResinTech Inc.*, *Southern Clay Products, Inc.*, *St. Cloud Mining Company*, *Süd-Chemie AG*, *W.R. Grace & Co.*, *Zeochem*, *ZEOX Corp.*, and *Zeolyst International*, among others.

"Nanoporous Materials: A Global Strategic Business Report" announced by *Global Industry Analysts, Inc.* provides a comprehensive review of market drivers, product profile, players, recent developments, mergers, acquisitions, and other strategic industry activities. Analysis is presented for product segments such as *Zeolites*, *Activated Carbon*, *Silica Gel*, *Activated Alumina*, *Clays* and Others.

NANOMEMORY

[GIA](#) announces the release of a comprehensive [global report on Nanomemory market](#). **Nanomemory** is a technology that is capable of providing efficient memory storage solutions for new age devices. The technology is expected to receive a breakthrough in near future, as traditional storage solutions fail to scale up to increasing memory storage requirements. Consequently, the global market is expected to reach **\$15.4 Billion** by 2015.

Present day memory storage devices are facing increasing requirements of higher write/read speed and storage capacity, and are inching towards stagnation in capabilities for scaling-up silicon technology. Growing popularity of disposable electronic products such as electronic greeting cards, RFID tags, electronic tickets, and smart cards among others has also increased the need for improved memory options. Nanomemory is one such technology that is capable of providing efficient memory storage solutions for new age devices. Nanomemory options would also be capable of meeting pervasive computing requirements such as low cost, high-speed memory for sensors and smart cards, and non-volatile and high capacity memory for handheld devices and mobile computers. These requirements can be efficiently fulfilled by nanomemory options.

The global market for nanomemory is expected to reach \$15.4 billion by 2015, as stated by the new market research report. MRAM is predicted to emerge as a suitable replacement for Flash/SRAM combo and battery supported RAM. Holographic memory is also expected to emerge as a strong contender for providing memory solutions for consumer video market and high-end data storage.

Nanotubes, utilized particularly in memory chips, integrated chips, optoelectronics and displays, nano memory cards, and removable molecular memory media are nanotechnology based memory storage devices that are likely to be employed in electronics.

Key market participants in the global nanomemory market include Advanced Micro Devices, California Molecular Electronics, Cavendish Kinetics, Colossal Storage, Cypress Semiconductor, Everspin Technologies, Fujitsu, Hewlett-Packard Development, Hitachi, Honeywell International, International Business Machines, Infineon Technologies, Intel, Nanochip, Nanosys, Nantero, Ovonyx, Ramtron International, NVE Corporation, Samsung Electronics, SanDisk, STMicroelectronics NV, Texas Instruments, ZettaCore.

The report titled "Nanomemory: A Global Strategic Business Report" announced by Global Industry Analysts, Inc., provides a comprehensive review of key market trends, product introductions/innovations, profiles of major players, and recent industry activity. The study presents extensive commentary on various types of nanomemory technologies, and provides long-term projections for global nanomemory market.

NANOPATTERNING

[GIA](#) announces the release of a comprehensive global report on [Nanopatterning market](#). Though conventional optical lithography techniques are widely used for fabricating integrated circuit chips with feature sizes up to sub-100nm, their downside is the very expensive nature of the high-tech lithography systems, which has restricted their usage to industries having access to ample funds. New, unconventional nanopatterning techniques attempt to fill this void by offering low-cost, high-throughout imprinting processes.

Continued research to pattern nanometer scale features using different materials and resists has ensued the emergence and progress of *hot embossing*, *UV-NIL*, *microcontact printing*, and *dip-pen nanolithography*, among others. Still under research is *nanostencil lithography*, a high-resolution, shadow mask method with dynamic potential.

Among the Nanopatterning technologies, *Nanoimprint Lithography (NIL)* exhibits the most promising outlook. With anticipation that NIL emerges successful for commercial semiconductor manufacturing at 32nm node in the near future, the market for NIL is projected to grow the fastest between 2008 and 2015. Of the NIL techniques, UV nanoimprint lithography is projected to grow the fastest from 2008 to 2015. Another NIL technique expected to perform exceedingly well is hot embossing lithography.

The second largest nanopatterning market, Scanning Probe Lithography, would see its share decline from 2008 to 2015. Among the diverse applications, semiconductor applications and microelectronics fabrication represent the largest nanopatterning application.

The global marketplace is characterized by participants such as Ambios Technology, Inc. (USA), AMO GmbH (Germany), EV Group (Austria), Hewlett-Packard Development Company, L.P. (USA), IMS Chips (USA), International Business Machines Corp. (USA), Micro Resist Technology GmbH (Germany), Molecular Imprints, Inc. (USA), NanoInk, Inc. (USA), Nanonex Corp. (USA), NanoOpto Corp. (USA), NIL Technology (Denmark), Obducat AB (Sweden), Optomec, Inc. (USA), Sigma-Aldrich Corp. (USA), STMicroelectronics N.V. (Switzerland), SUSS MicroTec AG

(Germany), Toppan Photomasks, Inc. (USA), Transfer Devices, Inc. (USA), Veeco Instruments, Inc. (USA), and Vistec Semiconductor Systems GmbH (Germany).

"Nanopatterning: A Global Strategic Business Report" announced by Global Industry Analysts, Inc. provides a comprehensive review of market trends, technologies, techniques, players, competition, research & development, recent developments, mergers, acquisitions, and other strategic industry activities. Global analysis is presented for nanopatterning technologies such as Nanoimprint Lithography (including hot embossing, UV-NIL, Microcontact Printing and others), Scanning Probe Lithography, and Other.

Nanobusiness News



[Unidym and Samsung to Develop and Commercialize CNT-Based Electronics](#)

Unidym, Inc., a majority owned subsidiary of Arrowhead Research Corporation announced today that it has completed IP cooperation and license agreements with Samsung Electronics Co., Ltd. ("Samsung"). Under the agreements.

[Full Story](#)

[Soitec Provides Order for AltaSight 300 Wafer Platform to Altatech Semiconductor](#)

Altatech Semiconductor S.A. has received an order for its AltaSight® 300 full-wafer inspection system from Soitec (Euronext Paris), the world's leading supplier of silicon-on-insulator (SOI) and advanced solutions for the electronics and energy industries.



[Full Story](#)

[MonoSol Partners with Midatech to Accelerate Nanoinsulin PharmFilm Development](#)



MonoSol Rx, the developer of PharmFilm® drug delivery technology, and Midatech Group Ltd., a global leader and centre of excellence for the design, development, synthesis and manufacture of nanomedicines, today announced their intent to form a joint venture that will focus on the development and commercialization of products combining the two companies' respective technologies in the diabetes field.

[Full Story](#)

[Greenspec to Sell and Service sp3's CVD Diamond Deposition Reactors in the Republic of Korea](#)

sp3 Diamond Technologies, Inc. (sp3), a leading supplier of diamond products, equipment and services, today announced that it has selected Greenspec, Inc. as a sales and services representative for the Republic of Korea.



[Full Story](#)

- [mPhase Completes Work Under Phase 2 STTR Grant for Multi-Cell Smart NanoBattery](#)



[New Nuance TRIO Multispectral Imaging System Now Available from LOT-Oriel](#)

Nuance™ TRIO is the newest addition to the Nuance product family. TRIO enables simple image capture of any three chromogens or three fluorophores in its spectral range. Additionally, autofluorescence is removed, increasing signal-to-noise by up to 100x improving quantitation.

[Full Story](#)

[Asylum Research Installs Dual System Order for Cypher and MFP-3D-SA AFMs at CSI](#)

Asylum Research, the technology leader in scanning probe/atomic force microscopy (AFM/SPM), announced today that it has installed a dual system order for a Cypher™ AFM and MFP-3D-SA™ AFM at the Cluster of Excellence "Smart Interfaces" (CSI), Technische Universität Darmstadt in Germany.



[Full Story](#)

[Assets of Montreal Based Nanotech Company Acquired by Versatilis](#)

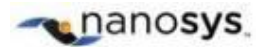


Versatilis LLC, a high technology development Company based here, announced today that it has acquired the technology assets of Nanometrix, Inc. of Montreal, Canada.

[Full Story](#)

[SEMATECH and Nanosys Join to Extend Non-Volatile Memory Technologies](#)

SEMATECH today announced that Nanosys, Inc., an advanced materials architect, has joined its Front End Processes (FEP) program, and will work with SEMATECH to develop new materials and processing techniques for extending flash memory technologies.



[Full Story](#)

[Peregrine Semiconductor, Soitec Join to Produce SOS Wafers for STeP5 UltraCMOS Technology](#)



Peregrine Semiconductor Corporation, a leading provider of high-performance radio-frequency (RF) integrated circuits (ICs), and Soitec (Euronext Paris), the world's leading supplier of silicon-on-insulator (SOI) wafers and advanced solutions for the electronics and energy industries, today announced the joint development and ramp in production of a new, bonded silicon-on-sapphire (SOS) substrate which has been qualified for use in manufacturing Peregrine's next-generation STeP5 UltraCMOS™ RF IC semiconductors.

[Full Story](#)

□ [Research Team Develops Nanoparticles to Combat Listeria](#)

[Shrink Nanotechnologies and EV Group Sign Multi-Year Agreement](#)

Shrink Nanotechnologies, Inc. ("Shrink") an innovative nanotechnology company developing products and licensing opportunities in the solar energy industry, medical diagnostics and sensors and biotechnology research and development tools businesses, announced today that it has entered into a multi-year development and manufacturing agreement with EV Group, a 30 year old Austria-based leader in the nano-imprint lithography process designing and equipment manufacturing.



[Full Story](#)

□ [Greenspec to Support Sales and Service of sp3's Model 655 and Model 665 Hot Filament CVD Diamond Deposition Reactors](#)

□ [JPK Instruments Opens First Sales Offices in France](#)

[Industrial Nanotech Partners With its Saudi Arabian Distributor to Expand into China](#)



Industrial Nanotech, Inc. an emerging global leader in nanotechnology based energy saving solutions, today announced that the Company is expanding into China in partnership with its distributor from The Kingdom of Saudi Arabia.

[Full Story](#)

[Boston Micromachines Signs Agreement with Bridger Photonics to Assess MEMS DM Technology](#)

Boston Micromachines Corporation (BMC), a leading provider of MEMS-based deformable mirror (DM) products for adaptive optics systems, announced today that it has signed a consulting agreement with Bridger Photonics to quantitatively assess a new MEMS membrane deformable mirror design using Boston Micromachines' facilities.



[Full Story](#)

[NanoString Secures License to Develop In Vitro Diagnostic Products for Breast Cancer](#)



NanoString Technologies, Inc., a privately held life sciences company marketing a complete solution for detecting and counting large sets of target molecules in biological samples, today announced it has secured an exclusive worldwide license from Bioclassifier, LLC to develop in vitro diagnostic and research products for breast cancer intrinsic subtyping.

[Full Story](#)

Selection by Senior Researcher Gabriela Hristea

"We master an area of research if we meet the following three conditions:

- We know the primitive values, the main derived values and the domain laws*
- We know how to demonstrate from the laws the important theorems of the domain*
- We can deduce, using laws and theorems, the future, present or past evolution of any phenomenon from the field, depending of the real data conditions, that are related to the initial state of the physical system. These phenomena are generated in that state of that physical system, and its border.*

Initial conditions and borders conditions are sufficient for the determination of uniqueness phenomena"

Acad. Remus Radulet "Fundamentals electrodynamics" 1954