

Workshop Program

“Advanced materials and technologies for micro/nano-devices, sensors and actuators:

From fundamentals to applications”

St.Petersburg, Russia, June 29-July 2, 2009

June 29, Monday morning

9:00- 9:15 am

E. Gusev and A.Dideikin

Welcome notes

Session 1. Micro/Nano-Systems: Past, Present and Future

Session Chairs: E.Gusev and R. Jammy

9:15- 9:45 am

V. Vaganov

Siantis Inc, California, USA

Challenges of complete CMOS / MEMS systems integration: Part I – History of MEMS/NEMS in Russia (USSR)

9:45- 10:15 am

M.Esashi

The World Premier International Research Center Advanced Institute for Materials Research, Tohoku University, Japan

MEMS for practical applications

10:15 – 10:45 am **Coffee Break**

10:45- 11:15 am

G. M. Rebeiz, I. Reines, R. Mahameed, H. Sedaghat-Pisheh, and C. Patel

The University of California, San Diego, La Jolla, CA

Advances in RF MEMS: angular-based actuators for high-yield stress-robust designs

11:15- 11:45 am

T.J. Sommer

European Commission, Directorate General Information Society and Media, Brussels, Belgium

European approach towards smart systems and public private partnerships

11:45- 12:15 pm

J.-C. Eloy, L. Robin, and E. Mounier

Yole Développement, France

MEMS markets overview

12:15 – 1:45 pm **Lunch**

June 29, Monday afternoon

Session 2. Device and Reliability Physics

Session Chairs: G.Rebeiz and M. Esashi

1:45- 2:15 pm

S.Krylov, and N.Dick

School of Mechanical Engineering, Faculty of Engineering, Tel Aviv Israel

Pull-in dynamics of electrostatically actuated bistable curved microbeams

2:15- 2:45 pm

P.G. Steeneken* and **J. Stulemeijer+**

**NXP Semiconductors, AE Eindhoven, The Netherlands,*

+Epcos Netherlands, AS Nijmegen, The Netherlands

Numerical continuation methods for non-linear MEMS actuators and oscillators

2:45- 3:15 pm

G. Papaioannou

University of Athens, Greece

The impact of dielectric material and temperature on dielectric charging in MEMS capacitive switches

3:15- 3:45 pm

P. Blondy, R. Stéfani, S. Courrèges, A. Pothier, J.C. Orlianges, A.Crunteanu, and M. Chatras

XLIM Research Institute, Limoges – France

Development of reliable and high power MEMS varactors

3:45 – 4:00 pm

Coffee Break

3:45- 5:45 pm

Monday afternoon poster session

June 30, Tuesday morning

Session 3. MEMS/NEMS Technologies and Applications

Session Chairs: V. Vaganov and T. Sommer

9:00- 9:30 am

D. Adams, D. Ascanio, N. Belov, B. Kim, G. Knight, G. Tchelepi

Nanochip, Inc., Fremont

T-K. Chou, J. Heck, Q. Ma, V. Rao

Intel Corp., Santa Clara

Nanochip: A MEMS-based ultra-high data density memory device

9:30- 10:00 am

**M. M. Hussain¹, C. E. Smith¹, D. Elata^{2,3}, K. Akarvardar², R. Parsa²,
K. Yoo², J. Provine², J. Williams⁴, K. Rader¹, J. Barnett¹, C. Park¹, M. Cruz¹,
P. D. Kirsch¹, H. –S. P. Wong², R. T. Howe², and R. Jammy¹**

¹SEMATECH, 2706 Montopolis Dr. Austin TX 78741, USA,

²Stanford University, USA

Ultra low power Sub-100nm laterally actuated Nano-Electro-Mechanical (NEM) switch in an industry standard process flow for logic and memory applications

10:00- 10:30 am

V.G.Golubev

Ioffe Physical-Technical Institute RAS, St Petersburg, Russia

Three-dimensional photonic crystals based on opal-semiconductor and opal-metal nanocomposites

10:30 – 11:00 am *Coffee Break*

11:00- 11:30 am

B. Vigna

ST Microelectronics, Italy

Low-cost silicon Coriolis' gyroscopes consumerize inertial measurement units

11:30 - 12:00 pm

A. Müller and D. Neculoiu

IMT-Bucharest, Bucharest, Romania

G. Konstantinidis

FORTH-IESL-MRG Heraklion, Crete, Greece

T. Vähä-Heikilä

VTT Technical Research Centre of Finland, Espoo, Finland

Microwave and millimetre wave devices based on micromachining of III-V semiconductors

12:00 - 12:20 pm

E. Gusev

Qualcomm MEMS Technologies, San Jose, USA

MEMS based displays

12:20 - 12:40 pm

P. Maltsev

SMC "Technological Centre" MIET, Moscow, Russia

Description of the Nano/Microelectromechanical systems RTD targets of the Russian Federation programmes

12:40 – 2:00 pm Lunch

June 30, Tuesday afternoon

Sessions 4: Advanced Processes and Materials – I

Session Chairs: E. Garfunkel and A. Müller

2:00 - 2:30 pm

H. Ashraf, J. Hopkins, L. M. Lea

Surface Technology Systems, Imperial Park, Newport, UK

Development of DRIE for the next generation of MEMS Devices

2:30 - 3:00 pm

J. Kiihamäki, H. Kattelus, M. Blomberg, R. Puurunen, M. Ylönen, P. Pekko, J. Saarilahti, H. Ritala

VTT Technical Research Centre of Finland, Espoo, Finland

Low-temperature processes for MEMS device fabrication

3:00 - 3:30 pm

N. Hoivik, H. Liu, K. Wang and K. Aasmundtveit

Institute for Microsystem Technology, Vestfold University College, Tønsberg, Norway

High temperature stable Au/Sn and Cu/Sn interconnects for 3D stacked applications

3:30 –4:00 pm Coffee Break

4:00 - 4:30 pm

M.M.V. Taklo*, K. Schjøllberg-Henriksen*, N. Lietaer*, J. Prainsack#, J. Weber¤, M. Klein¤, and P. Schneider+

**SINTEF, Department for Microsystems and Nanotechnology, Oslo, Norway*

#Infineon Technologies, Graz, Austria

¤Fraunhofer IZM, Berlin/Munich, Germany

+Fraunhofer ISS EAS, Dresden, Germany

3D integration of MEMS and IC: Design, technology and simulations

4:30 - 4:50 pm

A.N. Krivosheeva, A.V. Korlyakov, V.V. Luchinin, V.M. Pasyuta

Saint Petersburg Electrotechnical University "LETI", St. Petersburg, Russia

Passive and active membranes for MEMS

June 30, Tuesday evening: River boat trip & reception

5:30-8 pm

July 1, Wedn morning: Guided Excurcion to the Hermitage (half-day)

9:00 am -1 pm

1:00 – 2:00 pm

Lunch

July 1, Wednesday afternoon

Session 5. Sensors

Session Chairs: R. Ghodssi and A. Dideikin

2:00 - 2:30 pm

V. Vaganov

Siantis Inc, California, USA

Challenges of complete CMOS / MEMS systems integration: Part II – Recent Progress and Challenges

2:30 – 3:00 pm

Y. Eichen, A. Shemesh, S. Stolyarova, and Y. Nemirovsky

Technion-Israel Institute of Technology, Israel

MEMS composite porous silicon crystalline silicon cantilever-array biosensors: continuous sensing of explosive and chemical warfare agents

3:00 – 3:20 pm

G.V. Kamarchuk, A.P. Pospelov, A.V. Yeremenko, A.V.Savitsky, E.C.Faulques, and I.K. Yanson

B.Verkin Institute for Low Temperature Physics & Engineering of NAS of Ukraine, Ukraine

National Technical University "Kharkov Polytechnical Institute", Kharkov, Ukraine

Institute des Materiaux Jean Rouxel, Nantes, France

Point-contact gas-sensitive nanosensors

3:20 –3:40 pm

Coffee Break

3:40 – 4:10 pm

P.J. French

TU Delft, EI-EWI-DIMES, The Netherlands

Smart sensors: advantages and pitfalls

4:10 – 4:40 pm

**M.Jatlaoui¹, F.Chebila¹, P.Pons¹, H.Aubert¹, F.Cocchetti¹, G.Papaioannou^{1,2}, M.Dragoman³, D. Neculoiu³,
D.Dragoman⁴, A.Muller³, G.Konstantinidis⁵, and R.Plana¹**

¹*LAAS, University of Toulouse, France*

²*Solid State Physics Section, University of Athens, Greece*

³*National Research and Development Institute in Microtechnology, Bucharest, Romania*

⁴*University of Bucharest, Romania.*

⁵*FORTH-IESL-MRG, Heraklion, Greece*

RF MEMS/NEMS Technologies for advanced sensors and scavengers

4:40 – 5:00 pm

R.V. Gelamo, F.P. Rouxinol, C. Verissimo, A. Abbaspour, A.R. Vaz, M.B. de Moraes, and S.A. Moshkalev

Center for Semiconductor Components, Campinas, SP, Brazil

Carbon nanotube based pressure and gas sensors

Panel Discussion – Future of Micro/Nano-Systems Integration

Moderator: V. Vaganov

5:00 – 6:00 pm

July 2, Thursday morning

Sessions 6: Advanced Processes and Materials – II

Session Chairs: N. Hovik and P. Mal'tsev

9:00 – 9:30 am

R. Ghodssi, S. T. Koev, P. H. Dykstra, M. T. Meyer, K. Gerasopoulos, G. W. Rubloff, W. E. Bentley, G. F. Payne, and J. N. Culver

University of Maryland, College Park, MD, USA

Integration of diverse biological materials in Micro/Nano devices

9:30 – 10:00 am

A.A. Balandin

Nano-Device Laboratory, University of California- Riverside, USA

Graphene properties and possible micro/nano-device applications

10:00 – 10:20 am

J. Oberhammer, N. Somjit, M. Sterner, and G. Stemme

KTH-Royal Institute of Technology, 10044 Stockholm, Sweden

Monocrystalline-Silicon Microwave MEMS Devices: Multi-stable Switches, W-band phase shifters, and MEMS tuneable frequency-selective surfaces

10:20 – 10:45 am *Coffee Break*

10:45 – 11:15 am

E. Garfunkel

Rutgers University, Piscataway, NJ, USA

Surface characterization for MEMS/NEMS materials and processes

11:15 – 12:15 pm

A. Rusakov[§], P. Bystrov[§], A. Knizhnik[§], and B.V. Potapkin^{+,§}

[§]Kintech Lab Ltd, Moscow, Russia

[†]RRC "Kurchatov Institute", Moscow, Russia

Modeling of dry etching and deposition in production of MEMS

12:15 – 12:45 pm

H. Randriamahazaka*, P. Martin, J. Ghilane, J-C. Lacroix

Université Denis Diderot – Paris, France

Electrochemical models for the redox switching of conjugated polymers

12:45 – 2:00 pm **Lunch**

July 2, Thursday afternoon

Session 7. Nanodevices and technologies

Session Chairs: A. Vul' and B. Potapkin

2:00 – 2:30 pm

I.V. Lebedeva, O.V. Ershova

Moscow Institute of Physics and Technology, 141701 Dolgoprudny, Russia

A.A. Knizhnik and **B.V. Potapkin**

RRC "Kurchatov Institute", Moscow, Russia

Kintech Lab Ltd, Moscow, Russia

A.M. Popov, Yu. E. Lozovik

Institute of Spectroscopy, Troitsk, Russia

Modelling of NEMS based on carbon nanostructures

2:30 – 3:00 pm

Yu.E.Lozovik

Institute of Spectroscopy, Moscow Troitsk, Russia

Graphene: properties and modeling of nanodevices

3:00 – 3:30 pm

A.T.Dideykin

Ioffe Institute, St.Petersburg, Russia

Detonation nanodiamond - the promising material for MEMS/NEMS applications

3:30 – 3:50 pm

S. L. Rumyantsev*+ M. S. Shur*, A. Motayed♣, A. V. Davydov♣, M. E. Levinshtein+

** Rensselaer Polytechnic Institute, Troy NY*

+Ioffe Institute of Russian Academy of Sciences, St. Petersburg, Russia

♣National Institute of Standards and technology, Gaithersburg, Maryland

Low frequency noise in nano-objects

3:50 – 4:10 pm

P.S. Dorozhkin, A. Schekin, A. Shelaev, V. Bykov

NT-MDT Co., Zelenograd Moscow, Russia

Combined scanning probe microscopy and micro/nano Raman studies of modern nanostructures

June 29, Monday afternoon, 3:45-5:45 pm

Poster Session

O.V. Ershova, V. Lebedeva

Moscow Institute for Physics and Technology, Dolgoprudny, Russia

A.A. Knizhnik, B.V. Potapkin

RRC Kurchatov Institute, Moscow, Russia

Yu.E. Lozovik, A.M. Popov

Institute for Spectroscopy RAS, Troitsk, Moscow Region, Russia

Graphene bilayer: Nanotribology and NEMS applications

W. Nawrocki

Faculty of Electronics and Telecommunications, Poznan University of Technology, Poznan, Poland

Physical limits for scaling of electronic devices

E. Bichoutskaia¹, A.M. Popov², Y.E. Lozovik², O.V. Ershova³, I.V. Lebedeva^{3,4,5}, A.A. Knizhnik^{4,5}

¹*Department of Chemistry, University of Nottingham, University Park, Nottingham, UK*

²*Institute of Spectroscopy, Russian Academy of Sciences, Troitsk, Moscow region, Russia*

³*Moscow Institute of Physics and Technology, Dolgoprudny, Moscow region, Russia*

⁴*RRC "Kurchatov Institute", 1, Moscow, Russia*

⁵*Kinech Lab Ltd, Moscow, Russia*

NEMS based on interaction of the walls of carbon nanotubes

G. Ayvazyan, and R. Barsegyan

Engineering Academy of Armenia, Armenia

Mechanical stress in PECVD silicon oxide films for MEMS application

V.A. Karachevtsev, A.Yu. Glamazda, M.V. Karachevtsev, and O.S. Lytvyn

B.I.Verkin Institute for Low Temperature Physics and Engineering, Kharkov, Ukraine,

V. Lashkaryov Institute of Semiconductor Physics, Kyiv, Ukraine

Bionanohybrids formed by carbon nanotubes:DNA for biosensing

A.Kharlamov, V.Fomenko, A.Skripnichenko, N.Gubareni

I.N.Frantsevich Institute for Problems of Materials Science, Kiev,Ukraine

Thread-like anisotropic transparent crystals of carbon

Andrey B. Kozyrev

St. Petersburg Electrotechnical University (LETI), St. Petersburg, Russia

Characterization of ferroelectrics for microwave applications

A.L. Despotuli, and A.V. Andreeva

Institut of Microelectronics Technology and High Purity Materials, Russian Academy of Sciences, Chernogolovka, Russia

Nanoionic supercapacitors for new technologies

Y.Voronov, A.Kovalenko, M.Nickiforova, B. Podlepetsky, N.Samotaev

Department of Micro- and Nanoelectronics, Moscow Engineering Physics Institute, Moscow, Russia

A.Vasiliev, S. Gogish-Klushin, O.Gogish-Klushina, D.Kharitonov, R.Pavelko

Russian Research Center Kurchatov Institute, Moscow, Russia

Gas sensors based on microtechnology and MEMS platforms

P.V. Seredin*, A.V. Glotov*, E.P. Domashevskaya*, I.N. Arsenyev+, D.A. Vinokurov+, I.S. Tarasov+

**Voronezh State University, Voronezh, Russia*

+ Ioffe Physical Technical Institute, Saint-Petersburg, Russia

Structure property of Al_xGa_{1-x}As/GaAs(100) autoepitaxial heterostructures

S. Sukhoveyev

Electronics Department, Sub-Faculty of Micro System Techniques, Moscow State Institute of Radioengineering, Electronic and Automatic (Technical University), Moscow, Russia

MEMS and NEMS on basis of fibrous composites

V. V. Tomaev

Department of Chemistry, St. Petersburg State University, St. Petersburg, Russia

The new ferroelectric sensors material on the base of nanocomposites PbSe+PbSeO₃

V. V. Tomaev, Yu. S. Tver'yanovich, and M. D. Bal'makov

Department of Chemistry, St. Petersburg State University, St. Petersburg, Russia

SnO₂ –based film with a filamentary nanomorphology for gas sensors materials

R.R. Khaydarov*, R. A. Khaydarov[#], Y. Estrin[#], S. Evgrafova⁺, and S. Wagner[&] *Institute of Nuclear Physics, Tashkent, Uzbekistan

[#]ARC Centre of Excellence for Design in Light Metals, Monash University and CSIRO Division of Materials Science and Engineering, Clayton, Victoria, Australia

⁺V.N. Sukachev Institute of Forest SB RAS, Krasnoyarsk, Russia

[&]Institute of Technical Chemistry, Leibniz University Hannover, Germany

Nanosilver-based materials for industrial applications

A.Pashaev^{*}, V.Aliyev^{*}, O.Davarashvili^{}, M.Enukashvili^{**}, and V.Zlomanov^{***}**

**Institute of Physics NAS, 33, Cavid ave., AZ-1143, Baku, Azerbaijan*

***Tbilisi State University, 1, Chavchavadze ave.,380028, Tbilisi, Georgia*

**** Moscow State University, GSP-2, 119991, Moscow, Russia*

Mismatch problems in heterostructures on the base of IV-VI semiconductors

N. Starodub^{*}, N. Mel'nichenko⁺, and A. Shmireva^x

**National University of Life and Environmental Science, Kiev, Ukraine*

⁺Kiev National Technical University of "KPI", Kiev, Ukraine

^xTaras Shevchenko Kiev National University, Kiev, Ukraine

Biosensors based on the nanostructured silicon: development and practical application

V.Ivanov, K.Kandaswamy

School of Civil and Environmental Engineering, Nanyang Technological University, Singapore

C. Yang

School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore

Roman Stocker

Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, USA

Viktor Stabnikov

Institute of Municipal Activity, National Aviation University, Kiev, Ukraine

Microfluidic cell separator for microsensor of live bacterial cells

O.O.Udovyk

I.Frantsevich Institute for Problems of Materials Science, National Academy of Sciences of Ukraine

Solar fullerenes and carbon nanotubes

Osman Adiguzel

Firat University, Department of Physics, Turkey

Internal stresses in martensite formation in copper based shape memory alloys

**D. Chicherin¹, M. Sterner², Z. Baghchehsaraei², J. Oberhammer², S. Dudorov¹, Z. Du¹, T. Zvolensky¹,
A. Vorobyov³, M. de Miguel Gago³, E. Fourn³, R. Sauleau³, T. Labia⁴, G. El Haj Shhade⁴, F. Bodereau⁴, P.
Mallejac⁴, J. Åberg⁵, C. Simovski¹, A.V. Räisänen¹**

¹ Dept. Radio Science and Engineering, TKK – Helsinki University of Tech., Finland,

² Microsystem Technology Lab, KTH - Royal Institute of Technology, Sweden,

³ Autocruise S.A., France, ⁴ IETR, Université de Rennes 1, France

⁵ MicroComp Nordic AB, Sweden,

MEMS tunable metamaterials for beam steering millimeter wave applications

S.V. Ordin¹, A.J. Zjuzin¹, Yu. Ivanov² and S. Yamaguchi²

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Center of Applied Superconductivity and Sustainable Energy Research (CASER), Chubu University, Japan

Nano-structured materials for thermoelectric devices