

SITEX 45 SRL



WHO WE ARE

Parcul științific și tehnologic

SITEX 45 SRL successfully involved since 1992 as SME with industry oriented research & development activities on the basis of very closed cooperation industry "academia" research institutions acting in micro/nanotechnologies innovative applications fields

- ✓ R&D, manufacturing and prototyping of microelectronics components and optoelectronics devices, sensors and sensors arrays, transducers and microsystems as MEMS & MOEMS, semiconductor devices, RFID innovative solutions;
- ✓ R&D activity for new materials development and dedicated applications for micro & nanotechnologies;
- ✓ Design and engineering for new materials applications including nanostructured for microsystems and sensors productions;
- ✓ Design and engineering of potential MST/sensors applications for new materials developed by a specialized partners IMNR Bucharest (R&D Institute for nonferrous and rare metals) for biocompatible and multifunctional thin films (materials piezoelectric, ferroelectric, core/shell structured), ceramic and polymers nanocomposite;
- ✓ Design and engineering for microcontamination control and environment monitoring systems.

COMPANY HISTORY

SITEX 45 SRL started its operations in 1992 as SME company headquarter in *The Science and Technological Park for Micro and Nanotechnologies MINATEC-RO Bucharest*.

SITEX has three branches into main romanian cities:

- Microsystems Integration, SMT/hybrid/Packaging and Instrumentation development (Curtea de Arges 1998);
- R&D and microproduction of substrates as nanostructured materials ,ceramics, composites and smart metallic alloys (Cluj-Napoca 2003);
- Materials characterization (Timisoara 2005).

AFFILIATION MEMBERSHIP - SITEX is member of:

ONEXUS (European Microsystems Network) & Ass.

oEUROPRACTICE and Smart Systems Integration ETP - EPoSS,

o 4M (Multi Material Micro Manufacture), Network of Excellence & Ass

o PHOTONICS 21 ETP

o NANOFUTURES,MANUFUTURE and NANOMEDICINE ETP`s

- ICCCS (International Confederation of Contamination Control Societies)
- GUS Gesellschaft fur Unwellsimulation eV (G).
- AMA (Association for Sensor Technology) GmbH (G)
- SEMI Standards Committees (USA)

ORGANIZATIONAL STRUCTURES

Micro and nanotechnologies for micro and optoelectronics, microsystems sensors and actuators;

Environment protection and monitoring, energy novel sources;

Pharmaceutical, medical and biotechnologies;

The company act also as system integrator for custom or semicustom projects.

Services provider as "one stop shop" for unconventional technologies microprocessing.

I. RESEARCH & DEVELOPMENT PROJECTS

NATIONAL R&D PROJECTS MATNANTECH ,CEEX (RESEARCH OF EXCELLENCE),. National R&D Program PNII 2007-2013

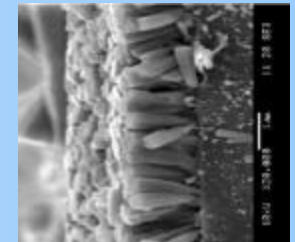
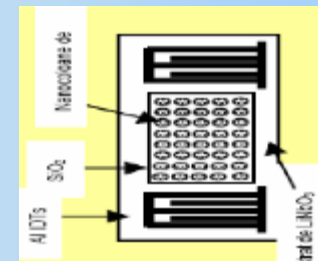
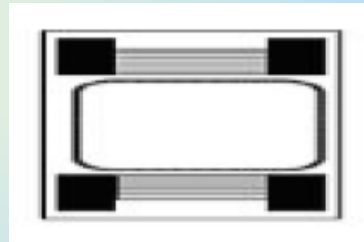
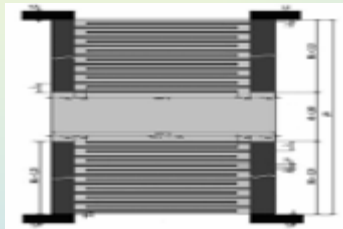
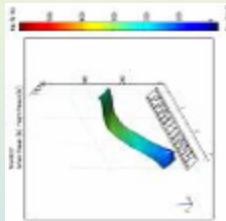
- *Nanostructured films with controlled properties of multifunctional materials (PHASE SHIFTER) / IMNR Bucharest*
- *Integrated technological network for researches of biocompatible advanced structures for dental implantation (RETEȚDENT) /IMNR*
- *Integrated microsystems in real time monitoring of threshold parameters for optimization of oil resources operation (MICROSYSOIL) / IMT*
- *New technologies microbiosensors for real time detecting and monitoring tuberculosis in group with high potential risk (MICROBALERT) IM*
- *R&D development network for nanostructured composites materials for magnetic sensors and thermal barrier (NANOGRAF)/IMNR*
- *Microfluidics cooling devices onto surface micromanufacturing (μCANRAD)/ SITEX 45 SRL Bucharest*
- *Solar cells with high efficiency improved by microsystems technologies approaches - MICROSYSCCELL/ SITEX 45 SRL*
- *Hybrid nanostructured materials for sensors with potential use in therapy and diagnosis HINAMASENS 2007- 2010*
- *Nanoelectronic devices high frequencies based on carbon nanostructures for communications and environment monitoring/,NANO-HF,20072010,*
- *Areas of micro/nanosensors of detection in real time of aquatic medium contamination with chemical agents/,AQUAPROIECT, 2007-2010,*
- *Development of new complex tools for protecting health: laboratory-on-a-chip system/ TOOPROLAB, 2005-2008,*

INTERNATIONAL R&D COOPERATION PROJECTS of EC Programs FP5/FP6 (CRAFT, NoE's, Cooperative R&D Projects) and FP7 (STREP,IP) Marie Curie,MNT ERA NET, ΣUREKA,NATO (Science for Peace) .

- ❑ *Integration of piezoelectric thin films in microelectromechanical MEMS systems/Coordinator Sintef/Norway;*
- ❑ *Development of a kerf-loss optimized slicing technique for advanced materials/Coordinator Fraunhofer IPT, Aachen Germany;*
- ❑ *Nanotechnological development of sensors for biomedical applications and environmental protection/Coordinator ARMINES France;*
- ❑ *New technological environmental friendly processing for MEMS & MOEMS applications/ Coordinator SITEX (RO);*
- ❑ *Advanced technological solution for integrated MEMS/MCM's for communication applications/Coordinator SITEX (RO);*
- ❑ *Σ! 2566 EULASNET Umbrella for Laser technologies (Wien University).*
- ❑ *Improvement of industrial production integrating macro, micro and nanotechnologies / PMMAN (ARC GmbH/Austria)*
- ❑ *The shape memory alloys applications for MST, sensors and actuators fabrication / NEXUS European Microtechnologies, MINIPROJECT*
- ❑ *RFID/MEMS wireless and remote intelligent monitoring systems of construction facilities, MEMSCON / FP7 2008-2012*
- ❑ *Rapid manufacturing of lightweight of metal components, COMPOLITE / FP7 2008-2011*
- ❑ *Electrical monitoring of Pollution from heavy metal in silicon,/EMPHASIS FP 7 NMP-2008, Small-2 Consig. Nazionale Delle Ricerche .IT*
- ❑ *Concurrent materials and processes design for specific applications CO-MADE) P7 /NMP- 2008, SME -2, 229270-1 /Cardiff Univ (UK)*
- ❑ *Intelligent Monitoring System based on Acoustic Emissions Sensing for Plant Condition Monitoring and Preventative Maintenance MOSYCOUSIS FP7 2011-2013*
- ❑ *Innovative optical microsensors based on rare earth-doped phosphate glass-SENSGLASS / MNT ERA NET 2011-2013*

AREAS OF MICRO/NANOSENSORS OF THRESHOLD DETECTION IN REAL TIME OF AQUATIC MEDIUM CONTAMINATION WITH CHEMICAL AGENT ACQUAPROTECT

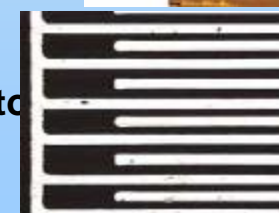
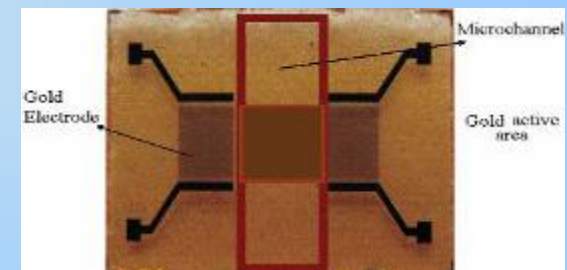
- Micro/nanosensors for threshold contaminants level of aquatic medium (internal flowing waters and of frontier, lakes, fountains).
- Area of double microsensors MOS/PIEZO type SHSAW that signaling the exceed of acceptable threshold of some substances (pesticide types, hard metals, hydrocarbures)
- Microsensors MOS (metal-oxide-semiconductors type ISFET) are differential and detectors of nostructured material with nanocolumns of ZnO piezoelectric substrate LiTaO₃ or by silicon.



Simulation senzor SHSAW on LiTaO₃ Quartz substrate Y rotated 42,5

Miniaturized immunosensor arrays technology for herbicide detection IMUNOSENSE

- develop the technology to produce an array of integrated immunosensors with optical and electrical detection in the ng/l domain of herbicides in food and water, involving microtechnology techniques
- on silicon and piezoceramic substrates, and molecular biology techniques
- study two distinctive procedures for the functionalisation of the substrate (microelectrod) at adherence of the bio-kit to this. by two techniques studied, in parallel, for surface functionalisation: the organo-functionalisation methods



4 μm SAW sensor on langasit substrate Interdigit electrodes below

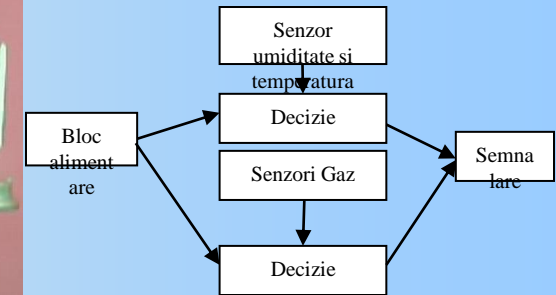
Multifunctional Microtransducers on Monocrystalline Piezoelectric Substrate for Stocking Conditions Monitoring **AGRICOLA**



General view of Microsystem

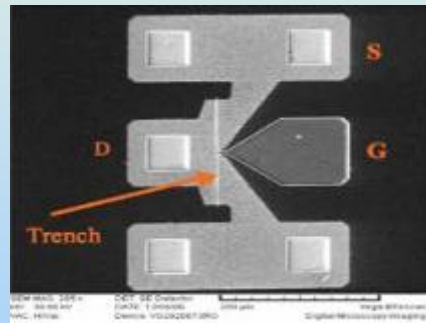


Test sensors for optimal detection of sensitive substances at different temperature/humidity/gases

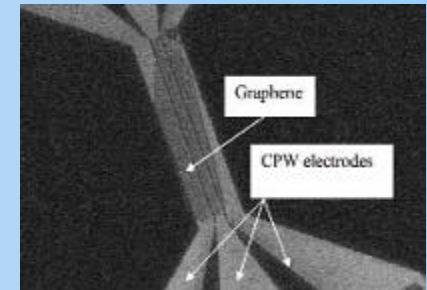
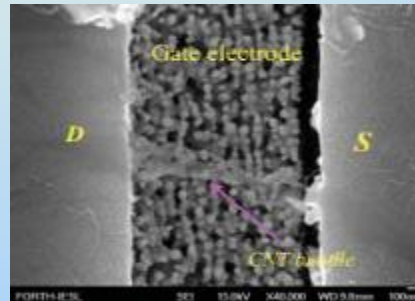


Microsystem Bloc diagram

Nanoelectronic devices for high frequencies based on carbon nanostructures for environment monitoring and communications **NANO-HF**



FET-like device: (a) top view drain source gate layout
(b) SEM suspended DWCNT bundle and 1µm gate electrode.



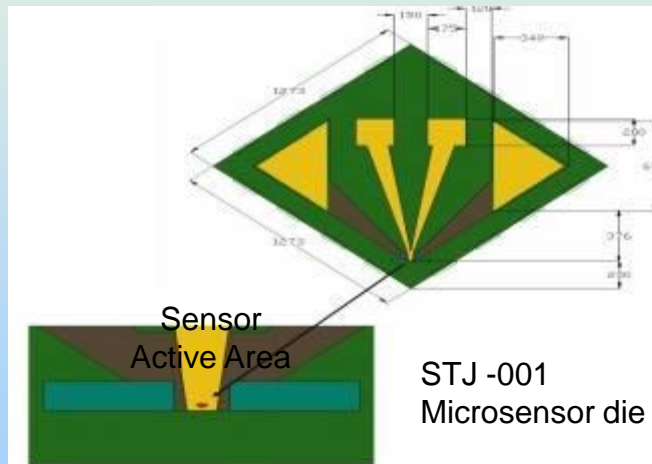
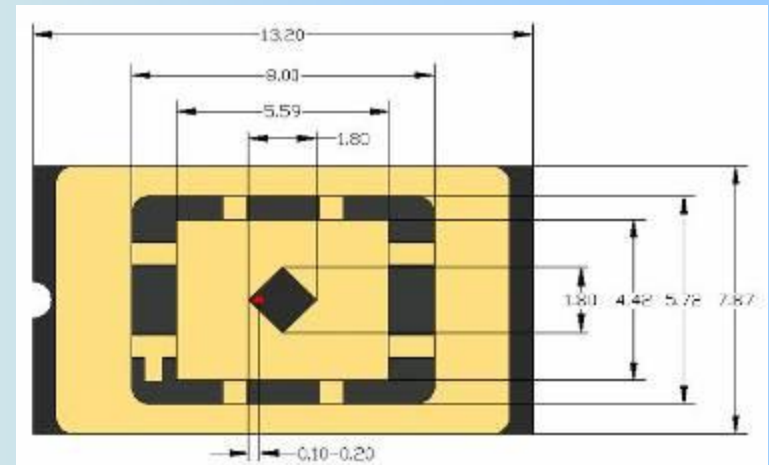
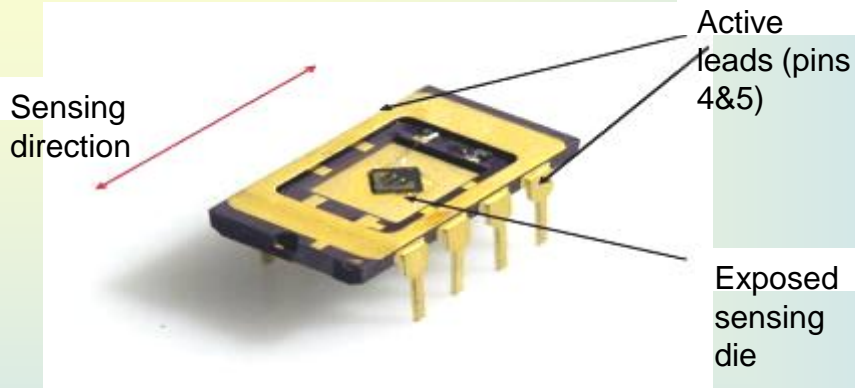
CPW lines on graphene

The **aim** Nanoelectronics based research on utilisation of nanomaterials like CNT or graphene with high mobility for microwave devices.

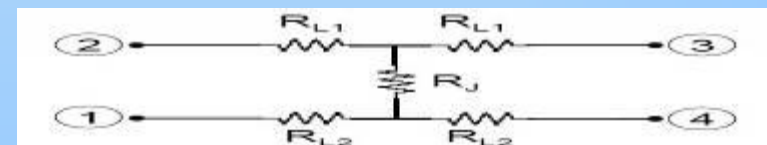
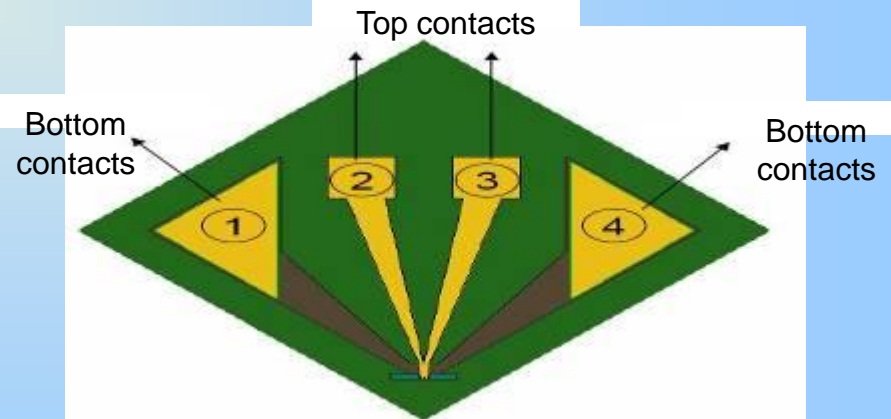
Achievements: The realization and characterization of FET based on CNT transistor and a CPW graphene test structure in the microwave range

C. MAGNETIC SENSORS

STJ 100 MAGNETIC MICROSENSOR



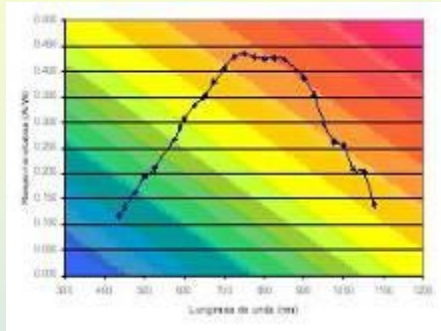
Die thickness 300 μ m Substrate: SiO₂ on Si
 (dimensions in μ m) Active area: 4x2 μ m
 Active area shape: elipsoidale Active thickness <0.1 μ m



High efficiency Photovoltaic cells by Microsystems Technologies.

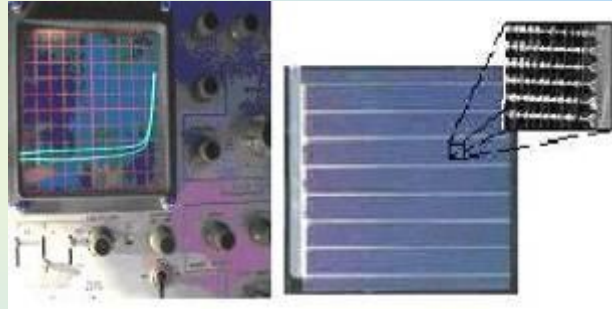
MICROSYSCELL

A. Special characteristics .

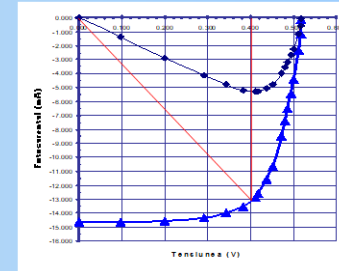


Spectral Characteristics of solar cells.

B. I-V characterizatics



IV parameter measurement of solar cell on wafer by Characterograph measurement.
Voltage scale 0,1 V/div. Current scale:1mA/div.

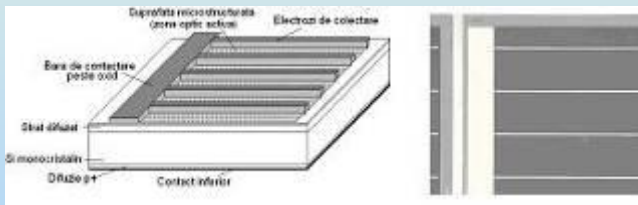


I-V Characteristics of PV cell.

$$P_{max} = 5,294 \text{ mW}$$

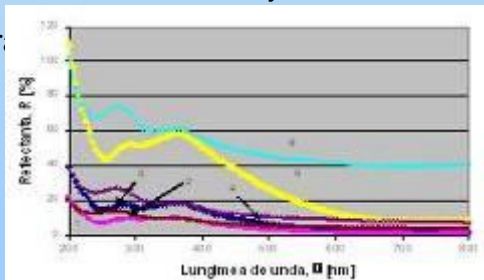
$$P = I_{sc}V_{oc} = 7,546 \text{ mW}$$

$$FF = 0,7015$$

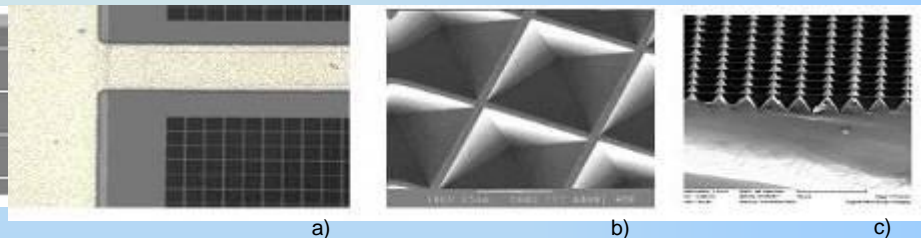


Solar Cells on Si monocrystalline

substrate



Spectral reflectance of solar cells .



Solar cell surface views a)- Optical b,c)-SEM of textured surface with reverse pyramids a)-structure detail, b) reverse pyramids c)-transverse section

1 – Textured surface with rectangular geometry with side of 3 μm and AR layer; 2 – Textured surface with rectangular geometrical side of 3 μm and unless AR layer; 3 - Textured surface with rectangular geometry side 10 μm and AR; 4 - Textured surface with rectangular geometry side 10 μm unless AR; 5 - Untextured surface with rectangular geometry side and AR; 6- Untextured surface unless AR.

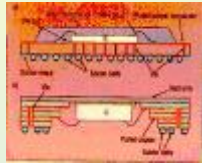
iii R&D OF MICRO/NANOTECHNOLOGIES APPLICATIONS FOR MICRO/OPTOELECTRONICS AND MICROSYSTEMS MEMS/MOEMS

1. THE MICRODRILLING OF MICROVIAS FOR MCM's, MEMS AND MOEMS APPLICATION

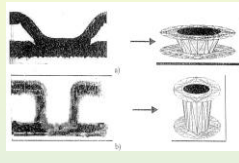
Processing technology: The solid state Nd – Yag laser with IR (1064μm) laser frequency and the frequency into the ultraviolet spectrum at 355 or 266 nm.

Materials: silicon, metals, metal oxides, ceramics, glass, PCB laminates, composites, polyamide.

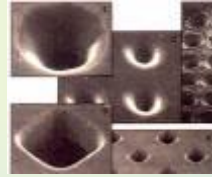
Applications: microdrilling for vias, microholes round, square and different configurations.



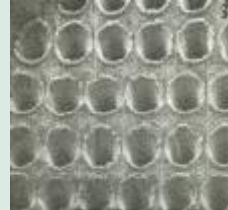
Microvias of 25μm for MEMS and MOEMS applications.



Section for blind vias
a) by plasma processing
b) by UV Nd – Yag laser.



Through hole vias in ceramics of high alumina, (25μm and square vias of 20x 20μm)



Network of microvias on ceramics (10μm)



Blind hole on the silicon substrate (side of 50μm and the depth of 80μm)



Microhole polyamide 10 μm

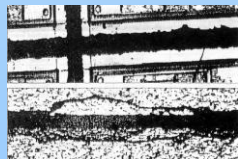
2. THE HIGH PRECISION MICROCUTTING AND SCRIBING OF INDIVIDUAL CHIPS SEPARATION / SINGULATION ON PROCESSED WAFERS LASAB NEW MATERIALS, MICRO AND NANOTECHNOLOGIES PROGRAM MATNANTECH

Processing technology: SLAB CO2 laser with high peak power and high repetition rate. P_{peak} = 3KW; P_{average} = 200W; Laser beam diameter = 50μm; Repetition rate = 0-100KHz; Pulse width = 5 - 400 μs; Pulse period = 16 - 400 ms; Positioning accuracy = 1μm

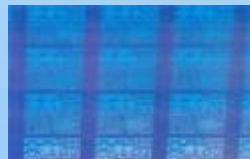
Materials: *silicon wafers*. External diameter 4"(100 ± 0.3μm); Thickness <380 μm; Taper = 8 μm, Bow <20 μm; Surface flatness <3 μm; Global flatness (TIP) < 7.4μm

ceramic high alumina (98%). Wafers 64x64mm, Thickness 0.8=1.2mm

Applications: microcutting individual chips, separation/singulation on processed wafers for microelectronics hybrid components microwave ceramic substrates



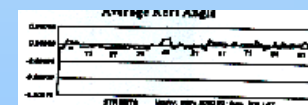
The view of front and back side wafers after dicing processing



The silicon wafers with processed chips before of laser microcutting



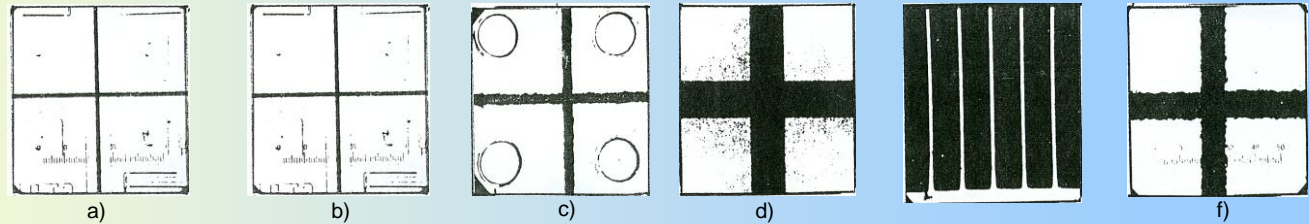
The hybrid components on high alumina



The wafer chipping proximity map

THE HIGH PRECISION MICROCUTTING A/O SCRIBING OF INDIVIDUAL CHIPS SEPARATION / SINGULATION ON WIDE RANGE MATERIALS OF PROCESSED WAFERS ERBIC INCO

- a) Silicon Wafer; Cutting depth: 200 μ m
- b) Silicon Wafer; Cutting depth: 200 μ m
- c) Gallium Wafer; Cutting depth: 350 μ m
- d) Alumina Ceramic; Cutting depth: 630 μ m
- e) Single Crystal Ferrite; Cutting depth: 2.5 μ m
- f) Glass Plate; Cutting depth: 500 μ m

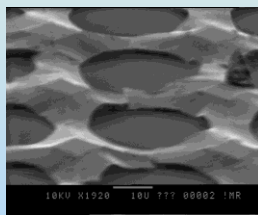
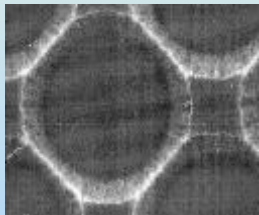


3. 2D / 3D PROCESSING OF MICROLENS, MICROLENS ARRAYS AND MICROALVEOLES FABRICATION

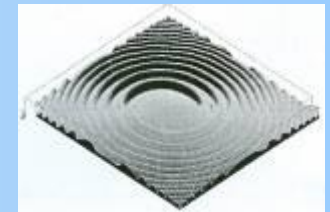
Processing technology: Chemical etching by KOH7M at 80°C. Laser processing by UV, FS, DPSS under development.

Materials: borosilicate glass CORNING 7059, thickness 500 μ m.

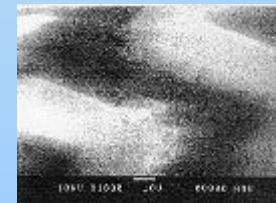
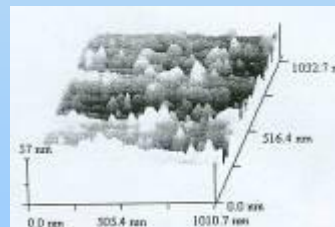
Applications: micromachining for microlens, microlens arrays, microalveoles for MOEMS, microsensors and microtransducers optical fiber coupling systems, diffractive elements, etc.. Micromatrix with dimension of 2x2mm² and 2x2cm², 1300000 cells, 100 cells having diameter of 20 μ m with depth between 4-8 μ m



SEM image of individual cells and matrix of microcells



Microlens arrays 22x22 μ m, 216.8 μ m pitch



Diffractive optical elements 10x10 μ m, 2-3 μ m resolution

4. MICRO AND NANO CLEANING OF THIN AND ULTRATHIN LAYERS EUREKA

Processing technology: Excimer laser, $4.4 \times 10^7 \text{ W/cm}^2$ and $7 \times 10^7 \text{ W/cm}^2$

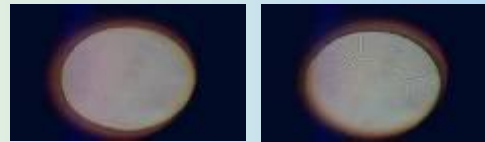
Materials: polymers as photoresist $0.2\text{-}12\mu\text{m}$, metals, thin and ultrathin layers as copper, gold, titanium 1000\AA - 5000\AA .

Applications: microelectronics and optoelectronics micro and nano devices.

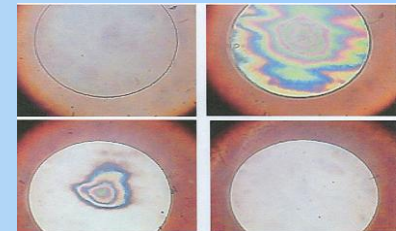


Laser removal of a film of photoresist ($2 \mu\text{m}$ thick) from silicon substrate

Laser intensity: $0.6 \times 10^7 \text{ W/cm}^2$; Number of pulses: 2, 10, 20



Laser removal of a titanium layer ($0.3 \mu\text{m}$ thick).
Laser intensity: $59.5 \times 10^7 \text{ W/cm}^2$, Number of pulses: 1, 2.



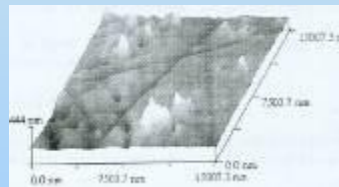
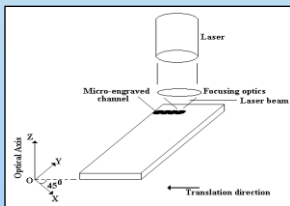
Laser removal of a thin film of photo resist ($0.3 \mu\text{m}$ thick) from silicon substrate
Laser intensity: $0.6 \times 10^7 \text{ W/cm}^2$; Number of pulses: 5, 15 (from left to right)

5. MICROENGRAVING OF KDP (POTASSIUM DIHYDROGEN PHOSPHATE) CRYSTALS

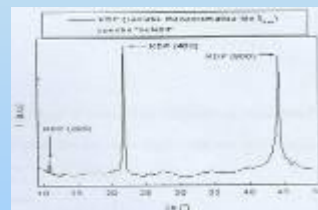
Processing technology: CO₂ laser: beam diameter at the focal point: $100 \mu\text{m}$; wavelength: $10.6 \mu\text{m}$; pulse duration: $20 \mu\text{s}$; pulse repetition rate: 125 Hz; atmosphere: nitrogen gas at 2 atm; crystal translation speed: 5m/sec

Materials: Potassium Dihydrogen Phosphate (KDP) crystal; $20 \times 50 \text{mm}$, thickness 1.2mm

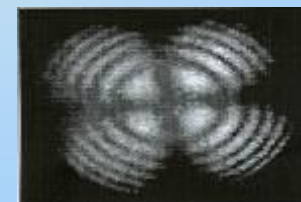
Applications: MOEMS for optical communications, data processing, integrated electro-optic modulators based on optical nonlinear crystals.



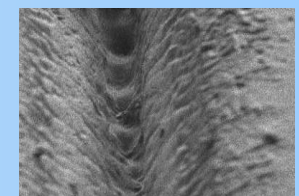
AFM image (after mechanical polishing)



X-Ray diffraction pattern



Cinoscopic image

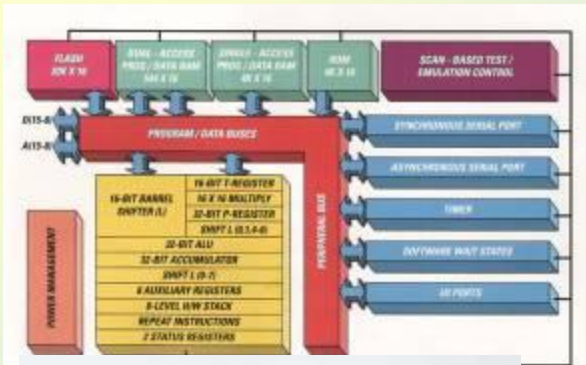


SEM image Middle of the channel

Experimental diagram set-up

DISSEMINATION over 90 papers and contributions at specialized conferences and symposiums as: CLEO EUROPE 2009, Advanced Laser Technologies 2004/ALT 04, 2005/ALT 05., SEMICON EUROPE 2008 -2010, 4M Conference 2005-2011 Micromachining USA 2008-2009, Sensors Test 2008,2010, CAS 2003-2009 , LIA 2009 (USA), SPIE 2005-2011.

E. INSTRUMENTATION AND SYSTEMS INTEGRATION APPLICATIONS



CO₂ detection instrument



Water contamination analysis instrument.
CORDOBA

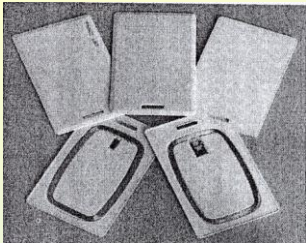


CH₄ detection in air
8/09.03.2012



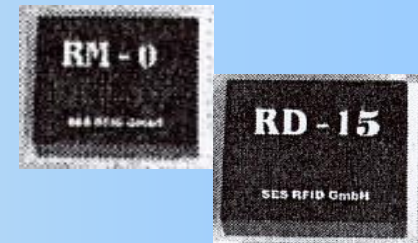
Magnetic safety system 10
SITEX 45 SRL Bucharest

F. RFID SOLUTIONS



Clamshell Card

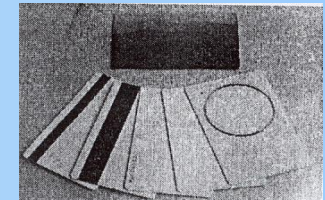
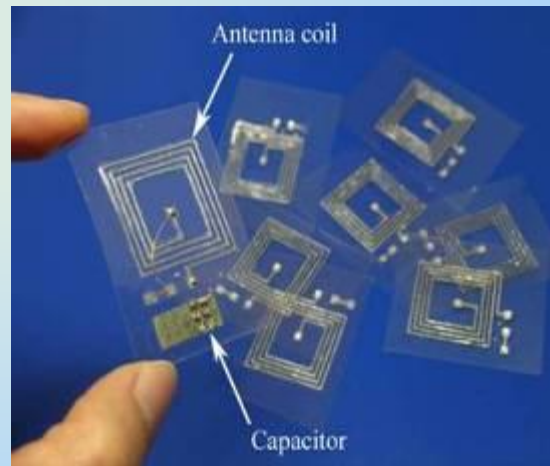
We are producer and supplier for RFID transponders, ISO cards, Clamshell cards, Key Fob and Tag Each RFID IC contains a unique code which is transmitted via the transponder antenna when the device is in close proximity to a reader device.



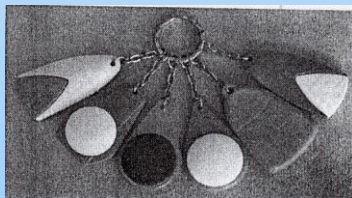
Reader Module

Features:

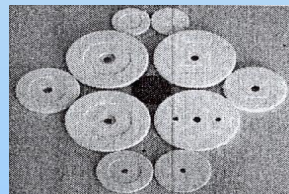
- o 125KHz/13.56MHz operation frequency
- o 64 bit/256bit/1K byte of factory programmed EPROM array
- o On-chip full wave rectifier
- o On-chip buffer capacitance and voltage limiter
- o Large reading range
- o Punch hole for attachment to chain or strap
- o (Clamshell, Key Fobs, smart labels)



ISO Card



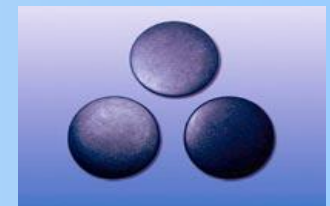
Key Fob



Tag

Applications:

- ID cards
- Access control and Security
- Health and Pharmaceuticals
- Industrial transponders
- Tracking monitoring system



Smart Labels

IV SERVICES

CLEAN ROOM AND MICROCONTAMINATION CONTROL

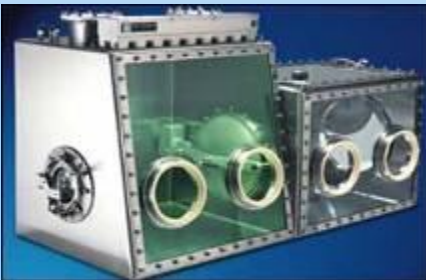
Clean room and ultrapure facilities **design, engineering and consulting services** special for microelectronics, pharmaceutical, medical and biotechnologies applications.



Clean room of any size and classification, bio-containment laboratories (PCL2/PCL3/PCL4) in accordance with the standards in force

Detailed project:

- ✓ optimization of the lay-out and production equipment
- ✓ design of the utilities production stations and distribution network
- ✓ choice of instruments and control system
- ✓ contamination control and HVAC system design
- ✓ design of the facility monitoring system
- ✓ Validation, on site testing and characterization



SITEX 45 certified to apply for validation following regulations:
ISO 14644-1, ISO 14644-2, ISO 14644-3, PD 6609-2000, EU GMP, EN 12469