



## Emerging MEMS devices: rocketing markets are not for real yet!

In this issue of Micronews, we have chosen to focus our special report on emerging MEMS devices. By "emerging", we mean MEMS devices which are today at the R&D level or have just entered the market. Two examples of devices which are quite often discussed are the RF MEMS and the microspeakers. A few years ago, the market for first ones was really expected to rocket with CAGR of tens of %. Today, it seems that we have a much more reasonable picture. Some companies have now started to produce RF MEMS (Matsushita, Agilent ...), but we are only at the beginning of the curve. One key issue to achieve high volume production at low cost of RF MEMS is the use of IC-compatible lines. IC manufacturers are more and more involved in the MEMS business and there are clear advantages of using IC mature technology (this topic will be developed in the next issues of Micronews). A second key point for market success is the reliability of RF MEMS and switches in particular.

Another second example: microspeakers, is also today at the front of the stage. However, in this case, no real industrial production seems to have started yet. According to leading MEMS-based Microspeaker Company, there is still much work to be done before shipping a reliable MEMS microspeaker.

Although much ado is often made when exciting market opportunities are promised through innovative developments, the market reality is much less enthusiastic when talking about exponential growth. The increase of the MEMS market will always be driven by numerous niche applications and many new "emerging" MEMS devices will contribute to that: flow sensors, uncooled micro-bolometers, micro spectrometers, implantable micro pumps, micro motors ...

Dr Eric Mounier  
Editor-in-chief

### MEMS

Tegal received endeavor AT PVD tool order

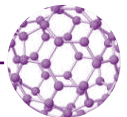
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Managing Editor: Jean-Christophe Eloy - Editor in chief: Dr. Eric Mounier - Editorial secretary: Dr. Eric Mounier - Editors: Dr. Eric Mounier, Sandrine Leroy, Jérôme Mouly, Dr Gabriela Miu - Communication & Business Relations Manager: Sandrine Leroy - Production: Mathieu Quiblier - Yole Développement: 45, rue Sainte Geneviève, F-69006 Lyon, France - TEL. (33) 472 83 01 80 - www.yole.fr

## List of companies cited in "Micronews"

**MEMS** BigTec, IntelliSense, LioniX, MEMSCAP, MEMSTech, Micromotion GmbH, NanoEmboss, NIF Ventures, Sonartec, Suss MicroTec, Tegal, Unaxis Semiconductor, **NANO** BAE Systems, EV Group, GE Global Research Harvard University, Nantero, Oregon Nanoscience and Microtechnologies Institute, Tailored Materials **OPTICS** Aixtron, Alcatel, Bookham, COM, Dominant, Epistar, Flextronics, Highwave Optical Technologies, Hitachi, IBM, Kotura, NEC, Nichia, Nortel Networks, Osram, Panasonic, Thales, Toshiba, Varioptic **BIO** Affymetrix, Beckman Coulter, CIPHERGEN, Combimatrix, Evotec Technologies, Hitachi, Kalorama Information, Nimblegen Systems, Pamgene, PointCare Technologies, Qiagen, Strand Genomics, Takara Bio, Tecan, Till Photonics, University of Nottingham **SEMICONDUCTORS** ASM International, ASML, European Commission, Exitech, Freescale Semiconductor, IBM Research, Infineon, Inotera Memories, Intel, International Sematech, Motorola, Nanya Technology, SEMI, SIA, Soitec, STMicroelectronics, Suss MicroTec, VLSI Research

Yole index

|                     | Symbol |     | Total number of shares(M) | Price 01-01-04 | Price 23-07-04 | Variation year to date | High/Low    | Market cap(M) 23-07-04 |
|---------------------|--------|-----|---------------------------|----------------|----------------|------------------------|-------------|------------------------|
| <b>Material</b>     |        |     |                           |                |                |                        |             |                        |
| Okmetic (SF)        | OKM1.F | Eur | 16,9                      | 3,15           | 2,65           | -15,9%                 | 2.35/4.35   | 44,8                   |
| Soitec (F)          | SOIT   | Eur | 56,2                      | 4,34           | 4,60           | 6,0%                   | 3,71/5.87   | 258,4                  |
| <b>Equipment</b>    |        |     |                           |                |                |                        |             |                        |
| Süss Microtec (D)   | SMH    | Eur | 15,2                      | 9,83           | 5,31           | -46,0%                 | 4,80/12,60  | 80,5                   |
| STS (UK)            | SRTS.L | GBP | 31,4                      | 0,20           | 0,17           | -15,0%                 | 0,10/0,51   | 5,3                    |
| Ultratech (USA)     | UTEK   | \$  | 23,7                      | 29,56          | 12,51          | -57,7%                 | 10,99/35,55 | 296,4                  |
| <b>Components</b>   |        |     |                           |                |                |                        |             |                        |
| Memscap (F)         | MEMS   | Eur | 108,0                     | 0,40           | 0,27           | -32,5%                 | 0,25/0,66   | 29,2                   |
| Affymetrix (USA)    | AFFX   | \$  | 60,3                      | 24,30          | 27,38          | 12,7%                  | 20,45/38,20 | 1650,7                 |
| Cepheid (USA)       | CPHD   | \$  | 41,7                      | 9,76           | 8,94           | -8,4%                  | 4,00/13,56  | 372,5                  |
| Caliper (USA)       | CALP   | \$  | 28,6                      | 6,75           | 5,44           | -19,4%                 | 4,50/9,85   | 155,7                  |
| Elmos (D)           | ELG    | Eur | 19,3                      | 12,00          | 12,40          | 3,3%                   | 7,36/14,47  | 239,3                  |
| Dalsa (CA)          | DSA    | \$  | 16,4                      | 14,60          | 20,60          | 41,1%                  | 13,40/24,25 | 338,4                  |
| Motorola (USA)      | MOT    | \$  | 2342,1                    | 14,25          | 15,28          | 7,2%                   | 9,03/20,89  | 35787,0                |
| Analog devices(USA) | ADI    | \$  | 373,8                     | 45,95          | 39,26          | -14,6%                 | 35,20/52,37 | 14674,4                |
| STM (F)             | STM    | Eur | 901,0                     | 27,54          | 18,81          | -31,7%                 | 18,69/29,90 | 16948,5                |
| Melexis (B)         | MELE   | Eur | 45,6                      | 9,40           | 8,81           | -6,3%                  | 7,53/10,83  | 401,7                  |

## Book to bill ratio reached 1.12 in June, announced VLSI Research

The equipment industry continued its upward momentum in June according to VLSI Research Inc. Worldwide equipment billings amounted to \$4.4B, while bookings reached \$4.9B. June's sales were 10% higher than May's, while bookings were up 14.5%. The industry finished the first half of 2004 with flying colors, says the market research company. It garnered \$24.4B in revenues, 59% higher than in 1H03. Equipment bookings were solid and were 76% higher than same period a year ago. For the entire year, VLSI predicts equipment revenues to grow at 68%. Front-end capacity utilization cooled off somewhat in June with 96.9%, after three straight months of close to 100% utilization rates. Nevertheless, utilization rates are expected to hover above 95% for the rest of 2004.

| Billion USD        | Billings (3-month avg.) | Bookings (3-month avg.) | Book-to-Bill |
|--------------------|-------------------------|-------------------------|--------------|
| May 2004           | 3.97                    | 4.28                    | 1.08         |
| June 2004          | 4.38                    | 4.91                    | 1.12         |
| July 2004 (prelim) | 4.23                    | 4.78                    | 1.13         |

Source:  
VLSI Research, July 2004

<http://www.vlsiresearch.com>

## Global consumption of multifiber transmit link components to reach \$407 million in 2008, reports ElectroniCast

According to ElectroniCast Corporation's Multifiber Transmit Link & Components Forecast, the global consumption of multifiber transmit link components will raise rapidly, from \$53.4 million in 2003 to \$407 million in 2008. "Growth will be most rapid over the 2003-2005 spans, coming off the depressed consumption level of the overall fiber-optics industry in 2003, plus the fact that multifiber transceivers are now early in their application life cycle," said Jeff D. Montgomery, founder and chairman, ElectroniCast. The multifiber transmit link market is focused almost entirely on short (1-2 km) to very short (one meter) interconnect.

<http://electronicast.com/>

# New emerging MEMS devices

MEMS-based micro-phones and RF MEMS (especially switches) are great expectations for the future MEMS markets. This article highlights the current trends for these promising applications.

Are microphones, the next MEMS Eldorado ?

Today, there are numerous developments on silicon microphones. Figure 1 shows the different silicon-based microphone detection principle. There are mainly two branches in capacitive microphones, i.e., condenser microphones and electret microphones. A condenser microphone requires an external bias voltage for operation, but this is not the case for an electret microphone since it has an internal "built-in" bias. The main market opportunity for Si microphones is, of course, the cell phone market. It would be a replacement market: silicon microphone versus electret condenser microphone (ECM). Indeed,

ECMs can be damaged by high heat, thus they are soldered in place by hand. However, Si microphones can withstand the 260-degrees Celsius and allow more modern, automated "pick-and-place" assembly processes. Although it is an emerging market, the potential volume is huge as there were 480 million cell phones in 2003.

Today, cell phone manufacturers involved in R&D on silicon microphones are:

- Motorola (USA)
- Nokia (FIN)
- Samsung (K)

There are also many MEMS manufacturers involved in R&D on silicon microphones (for cell phones), some of them are:

- Akustica (USA)
- Bell Labs (USA)
- Knowles Acoustics (USA)
- Phone-Or (IL)
- SonionMEMS (DK)
- Infineon (D)
- VTT Electronics (FI)
- Best Sound Electronics (KR) (second ECM manufacturer)
- NHK STRL (JP) (partnering with Matsushita Electric Industrial, first ECM manufacturer)
- Innovation Technology Co. (CN)

The second market opportunity for silicon microphones is hearing aid instruments. Here again, it should be a replacement market. The advantage over ECM is a smaller size and thus a better aesthetics of hearing aid instruments (75% the size of a state-of-the-art electret based hearing instruments microphone). Here again, volumes are expected to be large, as about 7 million hearing aids have been manufactured in 2003. In the future, 28 million Americans - roughly one in 10 people - have some type of hearing impairment. Yet only 6 million Americans actually wear hearing aids. Major players involved in developments are:

- Siemens (D)
- GN Resound (DK) (agreement with Akustica)
- William Demant (DK)
- Starkey (USA)
- Phonak (CH) (discussion with SonioMEMS)
- Widex (DK)

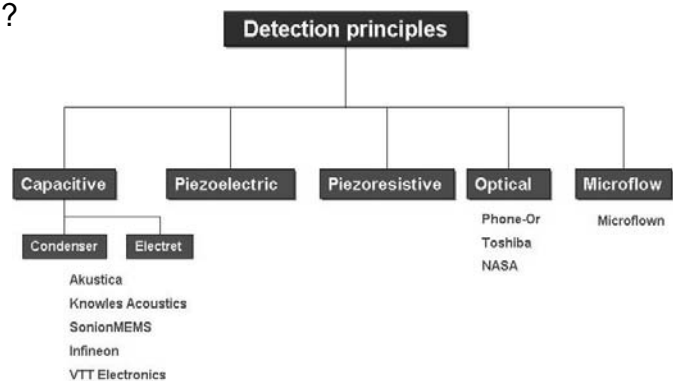


Figure 1: Si microphone detection principle



Figure 2: MEMS microphone is made by patterning plates in a plane and then folding them up by hand. The hinges on the edges are visible. Behind the open grill on the front is a membrane; it and the grill together form a capacitor. Sound moves the membrane relative to the grill and electronics (not shown) detect the changes in capacitance. (Courtesy of Flavio Pardo, Bell Labs, Lucent Technologies.)

## RF MEMS, when the market will rocket?

Today, it is believed that, among the numerous RF MEMS devices, it is RF switches which would likely find a myriad of applications for wireless communications including cellular phones (using up to 6 RF switches). Indeed, MEMS switches would allow cell phones to operate on multiple frequency bands. To achieve market volume, RF MEMS switches should have:

- Low insertion loss values (< 1 dB)
- Low cost (< 1\$)
- Low power operation

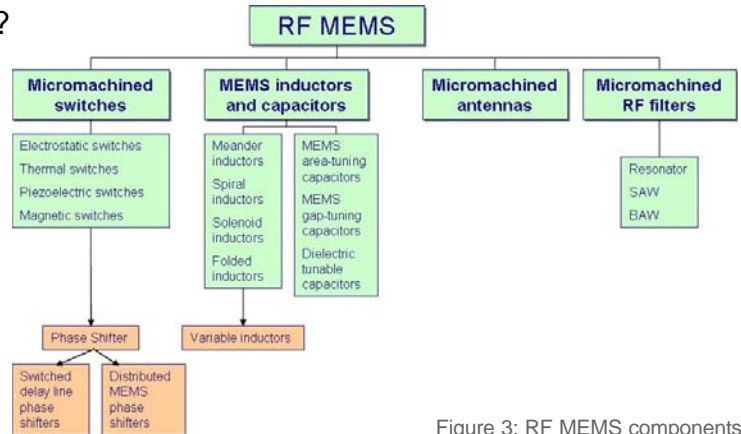


Figure 3: RF MEMS components

RF MEMS switches could make possible substantial reductions in the number of circuit elements needed in a system, and reduction of the size of antenna interface units by 10,000 times, cut power consumption by a factor of 1,000. Switching times are now on the order of several microseconds with a goal of less than 1 microsecond. Figure 4 shows the different RF MEMS switching technologies and players.

Other emerging MEMS devices are:

- Flow sensors (thermal or capacitive principle, there is a wide range of applications in bio, or industry fields)
- Uncooled infrared sensor: microbolometer (for civilian such as security, fire detection, ... and military applications, such as night vision)
- Micro spectrometers (for bio or chemical applications)
- Implantable micro pumps
- Microfluidic and biochips
- Micro motors

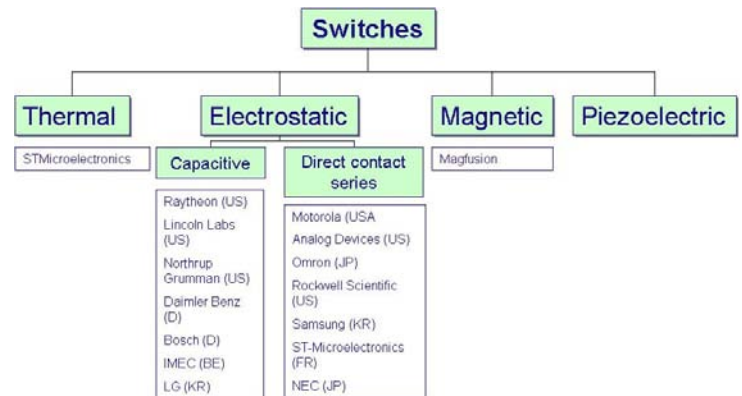


Figure 4: RF MEMS switching technologies and players

Among other emerging MEMS developments, some of them target to add MEMS process on top of III-V devices in order to have tunable capacities or change the beam of VCSELs ... (such as LEOM in France). It is still in R&D and will not be really active in industrialization before 2006 or 2007 due to the downturn of the telecom business. Another question may arise: will the coming of nano impact the MEMS industry in term of new applications and devices. Here at Yole, we believe that interaction between micro & nanotechnologies could be minimal as MEMS technologies are a Top-Down approach where the industrial tool is coming from the microelectronics industry, while nanotechnology is a Bottom-Up approach.

Yole Développement has just released the "Status of the MEMS Industry" report, including analysis on new emerging MEMS devices.

If you want to have more information, please contact Jean-Christophe Eloy at +33 472 83 01 82 or eloy@yole.fr.



## Sonion MEMS will launch its new Si based microphones this year

Based in Denmark Sonion MEMS was created in 2000, as a division of Sonion. Sonion has been working on silicon technology for 10 years, and its MEMS activities today employ 25 out of the company's 2,300 employees.

Mr Jacob Philipsen, President of Sonion MEMS presents us Sonion MEMS' technology and his point-of-view on Si microphones' market:

**SL: What are the activities of Sonion MEMS?**

JP: Within Sonion, the aim of the MEMS unit is to develop microstructures based on silicon substrates. We are developing and producing silicon microphones dedicated to the cell phone market. Indeed, we developed the smallest microphone worldwide: its size is less than 3 mm<sup>3</sup> (2.4mm x 1.4mm footprint). We are currently in the prototyping step with our customers. We have also another product in development, which will be deployed for the hearing aids market.

**SL: What is the Sonion MEMS technology added-value?**

JP: Our device is an all-silicon chip-scale-packaged microphone. It is composed of a microphone chip and an ASIC flip-chipped onto a silicon wafer. Our Company is working with several foundries for the production of specific micromachining processes. Sonion MEMS keeps inside some key process steps. For example, the development of ASIC device and the assembly step, which takes place in our in-house clean room facility. Our added-value is clearly based on the assembly of the microphone. With our technology, the devices withstand 250 °C, so they can be

Contact:

Jacob L. Philipsen, President, MicroElectroMechanical Systems, [jph@sonion.com](mailto:jph@sonion.com)

<http://www.sonion.com>

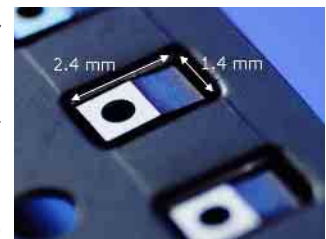
directly surface-mounted by lead free soldering onto a board.

**SL: According to you, what is the time-to-market of Si microphones?**

JP: Today, the cell phone market reaches approximately 600 million units per year. We expect silicon microphones to gradually replace existing electret microphones over the next 4 to 7 years. The Si technology is a real advantage for the cell phone market. We identify one competitor with a commercial product today. However we know that there are 4 or 5 companies that are in R&D phases.

**SL: What will be the next step of Sonion MEMS development?**

JP: As we now have our production line in place, next step will be the production ramp-up of our first products. To prepare the longer term future, we also take part in a European program called Mimosa. It is focused on ambient intelligence, and our partners include LETI, ST, and Nokia.



Sonion's SiMic

## QinetiQ, within INTEGRAM cluster, is developing a flow measurement solution



QinetiQ Ltd is Europe's largest Science & Technology organisation with a turnover >€1.3Bn and 9000 staff. The company has the largest MEMS team in UK and provides leading edge R&D, consultancy, design and prototyping with technology transfer for volume manufacture. QinetiQ leads the INTEGRAM Manufacturing Cluster in Europractice focused on integrated sensors and electronics. INTEGRAM has produced 3 Design Kits with process flows and design rules integrated into CoventorWare CAD software for QinetiQ's 3 micromachining processes that can be accessed via a MPW Service

QinetiQ's low-temperature CMOS-compatible metal-nitride SSM process produces ultra-low stress membranes that have been developed for use as microphones and ultrasonic transducers. Large arrays can be monolithically integrated with electronics for various applications and miniature sensors can be incorporated in small pipes to measure fluid flow, level and pressure. QinetiQ is working with customers to insert this exciting technology into applications including developing a flow sensor incorporating an ultrasonic source and detector, packaged for use in the retail sector. The sensor will be produced at a low cost in large volumes and will include temperature pressure and flow functions, which with redesign can be adapted for many different liquid and gas flow applications. QinetiQ welcomes further collaboration on other applications of this technology.

Contact:

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[www.QinetiQ.com/europractice](http://www.QinetiQ.com/europractice)

The Yole Développement magazine for MEMS, Nanotechnology, Optics, Bio & Microfluidic Chips and Semiconductors



## Announcement

# “Microsystems USA” to join NMW, March 7-10, 2005, Chicago - USA



In response to the demand for miniaturization of mechanical systems National Manufacturing Week (NMW) will be launching a new trade show and technical conference dedicated to this market. “Microsystems USA” will join NMW March 7-10, 2005 in Chicago and will target the fast growing technologies in the fields of micro-technology for mechatronic systems.

Microsystems USA will be unique in that it will embrace the full range of miniaturization technologies – milli, micro and nano. Buyers are interested in understanding costs and benefits of solutions available across the full range of miniaturization technologies and companies in this arena have been searching for an audience focused on miniaturization from a wide range of markets. Microsystems USA will fill this need in the marketplace providing the venue for engineers and buyers of miniaturization for optics, sensors, fluidics, motion, precision parts and services.

With over 20,000 attendees, National Manufacturing Week with its diverse audience of design engineers and buyers it is the perfect place to move miniaturization technologies into the mainstream for the long term future.

MicroNews is pleased to be a sponsor of this event and looks forward to a successful trade show and conference.

For further information: [www.microsystems-usa.com](http://www.microsystems-usa.com) or [www.manufacturingweek.com](http://www.manufacturingweek.com)

## AVAILABLE ON A CD-ROM, PROCEEDINGS The 1st European MEMS Technology Symposium

Price: Euros 300.00 for non BSAC members  
Euros 200.00 for BSAC members  
(VAT of 19.6% to be added for French customers)

Located in Munich, Germany, the one-day symposium conducted by Berkeley Sensor & Actuator Center (BSAC) faculty with famous invited speakers covered selected areas of the current MEMS research interest. This event was the first dedicated exposition of UC Berkeley and UC Davis MEMS research ever conducted in Europe.

### CONTENTS

- An introduction to MEMS topics, Richard S. Muller, BSAC
- Optical MEMS – Reflections & Projections, Richard S. Muller, BSAC
- The “E” in MEMS: Advanced electronic sensing, Bernhard E. Boser, BSAC
- MEMS impacts on RF wireless sensor Net approaches, Roger T. Howe, BSAC
- Mainstreaming MEMS: SiGe on finished CMOS, Roger T. Howe, BSAC
- MEMS foundry service at Bosch – Established process and new trends, Stefan Finkbeiner, Bosch
- Status of the MEMS industry: applications, markets and industrial organizations, J. C. Eloy, Yole Développement
- Technology for the MEMS processing and testing environment, Hans G; Kapitzka, Suss MicroTec
- Microfluidics, BioMEMS and Medicine delivery, Dorian Liemann, BSAC
- A MEMS magnetic immunosensor, Bernhard Boser, BSAC
- New systems from optical MEMS devices, David Horsley, BSAC

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[www.yole.fr](http://www.yole.fr)





## Announcement

# Micronora 2004, the 15th international microtechnology trade fair, from 28th September to 1st October, Besançon, France.



This year's fair will focus on the latest micromechanical and microelectronic developments. More than 800 exhibitors (including 38% foreigners) will be welcoming close to 16,000 visitors on the fair premises featuring 20,000m<sup>2</sup> of exhibition space and 9,000m<sup>2</sup> of stands.

Micronora enjoys the privilege of being the showcase of innovation for a whole sector of microtechnical know-how, as well as being a genuine industrial communication platform that will represent 9,000m<sup>2</sup> of multi-technology solutions for all industrial sectors.

A top-quality events schedule centred on innovation

Events organised during the fair offer an opportunity to take stock of developments in the microtechnology field and even to predict how they are going to develop further.

- Zoom 2004: an exhibition and top level conferences will confirm that micromechanics and microelectronics are two inseparable technologies;
- The Microns d'Or (Golden Microns) competition will reward six innovative technologies, which will allow prize winners to tap into new markets;
- The European Technology Meetings on micro- and nanotechnologies will take place on 30th September and 1st October.
- A French-Swiss day, on 30th September, will present various university partnership success-stories. Industrial players involved in these technologies will share their experiences.
- The head of the capital goods division of the French economic mission in Milan will attend the fair on 29th September to meet with companies interested in the Italian market.

For registration: [http://www.micronora.com/pre\\_register.php](http://www.micronora.com/pre_register.php)

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## Company's Report

# Low temperature plasma bonding for MEMS applications

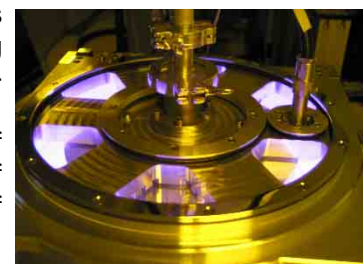
V. Dragoi, S. Farrens and P. Lindner

EV Group, DI Erich Thallner Strasse 1, A-4780 Schaerding, Austria

Wafer bonding is presently considered as one of the most promising techniques for MEMS/MOEMS fabrication and packaging. In MEMS industry wafer bonding is used mainly for building 3D structures by wafers stacking and for final packaging of devices.

A desire to expand the application field and take benefit of the huge potential of wafer bonding in solving many integration problems lead to the development of new low temperature wafer bonding approaches (maximum temperature of 400°C).

A newly developed dry process (LowTemp Dry Activation Plasma Bonding) uses a special process chamber and is carried at room temperature. The closed chamber setup enables the use of different plasmas (different process gases) and makes it applicable for silicon as well as for other materials. This technology is a very important development for bonding engineered substrates (deep etched wafers, CMOS, etc.), as well as for all heterogenous materials bonding applications where thermal mismatch has often been a show stopper for device development.



Plasma discharge in EVG810LT plasma chamber.

Visit us at COMS 2004, booth L16

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## Techno News

### Two MEMS sensors on the golf equipment market

Two innovators, Paul Kolen and Noel Perkins, have developed sensors used on greens ! Kolen, an electrical and computer engineering professor at San Diego State University, licensed technology to Sonartec Inc., a Carlsbad, Calif.-based golf club maker. He developed the Inertial Magnetic Motion Capture (IMMCAP) system, and is working with Sonartec to create a small unit that can be attached to clubs to measure and analyze a golfer's swing. Meanwhile, University of Michigan (U-M) Professor Perkins, who developed his own motion sensor-based device, has contracts with undisclosed manufacturers of golf clubs and fly-fishing rods to commercialize similar systems that provide data on a swing or an angler's casting technique. Professor Kolen was unaware of Perkins' project but not surprised to hear that someone else was working on similar technology with an eye on the same applications. Likewise, Perkins isn't shocked to learn that Kolen has his eye on the same markets.

<http://www.sonartec.com>

### Suss MicroTec introduces new spray coater for MEMS volume production

Suss MicroTec introduces the new Gamma resist processing system with AltaSpray spray coater from SUSS masters the challenge to reliably coat over severe topography and cover sharp edges while avoiding the accumulation of resist in trenches. The fully automated cluster offers high reproducibility, a prerequisite for volume production in thick resist wafer bumping and MEMS/MOEMS volume applications. The SUSS Gamma system with AltaSpray uses a novel spray coating technology. As spray

coating is extremely sensitive to the evaporation rate of the solvent, even extremely small changes in temperature, humidity and air flow can force too much solvent out of the resist and cause particle precipitation and contamination. The SUSS' patent pending AltaSpray approach delivers consistent conformal coatings over 90° corners, KOH etched cavities, V-grooves and lenses, making it the ideal tool for MEMS/MOEMS core production applications such as sensors, printer, read/write heads, and micro lenses, or for the patterning of deep trenches as required by interconnect processes for advanced packaging.

<http://www.suss.com>

## ANALYSIS OF THE APPLICATIONS AND TECHNOLOGY TRENDS

▶ MEMSoniC report

# QinetiQ

Price: 2,900 Euros/3,800 \$  
MEMS fabs profiles included  
Available September 2004

 YOLE DÉVELOPPEMENT

QinetiQ and Yole Développement have edited a new report describing the current applications, market and technology trends for integrated MEMS. The MEMS business is currently under strong re-organization. Since the past years, there has been a strong involvement of IC manufacturers in order to find in the MEMS business new opportunities, especially in MEMS for large volume market: Automotive with inertial MEMS, IT with micro-mirrors and telecommunications with RF MEMS. Moreover, many IC players have made large investments (STM, Infineon, Motorola, Fairchild, Dalsa Semiconductor, Semefab, Elmos, X-Fab ...). Integrated MEMS are expected to have increased market shares in the future but today there are still bottlenecks to overcome (process standardization, MEMS is not always a large volume market ...)

The MEMSoniC report will highlight the main motivation for MEMS on IC integration, the stakes of IC and MEMS integration, a comparison of process lines, a technology analysis (who is doing what), a description of the applications for MEMS integrated with IC, a market evaluation, an analysis of the different business models ...

The QinetiQ/Yole Développement report is also describing for the first time the Top 30 MEMS manufacturers worldwide, including a detailed analysis of the different companies, the manufacturing facilities, and the alliances and products portfolio.

Company profiles included in the report: Analog Devices, Bosch, Colibrys, Dalsa, Fairchild, hp, Infineon, MEMSiC, Micralyne, Motorola, QinetiQ, STM, TSMC, VTI Hamlin, X Fab ...

Contact to have more information or to purchase the report:

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## Unaxis lauched VERSALINE™ and the LLS EVO II

Unaxis Wafer Processing introduces the VERSALINE™ and the LLS EVO II, the newest production tools in the Unaxis family of high performance wafer processing equipment.

The VERSALINE, a modular system enabling etching and deposition technologies is easily customized to specific applications and budgets without compromising performance, according the company. The VERSALINE's specialized ICP, RIE, PECVD and PVD modules provide advanced solutions for applications including LEDs, HBTs, HEMTs, optoelectronics, and MEMS.

The LLS EVO II, a state-of-the-art batch sputtering system, provides optimum process flexibility with five sources each configurable for sputtering options including DC, RF, RF/DC, pulsed DC, and co-sputtering. Simple to operate and easy to maintain, the LLS EVO II delivers excellent film uniformity and reproducibility.

<http://semiconductors.unaxis.com>

## Nanoemboss will develop sensor for the detection of explosives

NanoEmboss has been awarded significant funding as part of an EU consortium to develop a chemical sensing system which will detect ultra low levels of explosives leading to increased security of people and their environment.

DETEX, a European Framework Six research initiative, brings together a leading consortium of research institutes and commercial organizations to develop a "tandem" chemosensor system based on highly selective and innovative technologies that will be used for ultra-trace detection of explosives.

NanoEmboss will provide the consortium with expertise in polymer microsystems, fabricating microsystem platforms that will integrate active and passive optics in a single polymer micro-bench.

<http://www.nanoemboss.com>

## Micro positioning in high vacuum conditions

The Micro Harmonic Drive gear achieves a high precision and accurate positioning even in vacuum conditions. For the output bearing special dry lubricated ball bearings with coated tracks are used. According to the specific application the gear is either dry lubricated or treated with special vacuum grease. Another detail that has been adjusted is the interconnection technology, for which a special UHV suited adhesive is used. All these adjustments have been successfully tested in vacuum conditions under pressures up to 10-12 bar.

The micro gear, which was developed by Micromotion GmbH, Mainz, suited for applications in semiconductor industry, satellite technology, electron microscopy, coating, space and medical technology.

<http://www.microgetriebe.de>

## STATUS OF THE MEMS INDUSTRY 2004: BACK TO NORMAL BUSINESS

### ▶ MIS report

Price: 1,900 Euros/2,400 US\$

MEMS fabs profiles included

Available June 2004

Yole Développement has edited a new report describing the current structure of the MEMS industry, the possible evolutions of the current business models and for the first time the detailed analysis of the Top 30 MEMS manufacturers worldwide. This report provides a complete analysis of the MEMS applications and markets as well as an in-depth analysis of the new applications under development. Yole Développement is also describing for the first time the Top 30 MEMS manufacturers worldwide, including a detailed analysis of the different companies, the manufacturing facilities, and the alliances and products portfolio.

Company profiles included in the report : Akustica, Analog Devices, Applied Mems, BAE, BEI Sensors, Bosch, Canon, Colibrys, Dalsa Semiconductor, Delphi, Denso, Fairchild Semiconductor, HL Planar, Honeywell, HP, IMT, Kionix, Memscap, Murata, Matsushita, Olivetti IJet, Omron, Samsung, Sensor/Infineon, SSS, STM, VTI Technologies, X-Fab ...

Contact to have more information or to purchase the report:

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# WORLD MEMS INERTIAL SENSORS MARKETS

## ▶ WISM report

**Price: 2,900 Euros/3,800 US\$**

### Companies' profiles included

The inertial sensor applications are the most buoyant among the MEMS markets. Yole Développement found that between 2002 and 2005, the compound annual growth rate (CAGR) of gyroscopes will exceed 25%, coming from 314 M\$ to 649 M\$ and the CAGR of acceleration sensor will reach 13%, coming from 420 M\$ to 560 M\$. For the first time, the markets for micro machined gyroscope will exceed acceleration sensor markets in 2005. Both markets are now dominated by automotive applications.

Yole Développement has edited a new report describing the MEMS inertial sensor markets. This report provides a complete analysis of the micro machined acceleration sensor and gyroscopes applications and markets. Yole Développement is also describing for the first time the market shares in the automotive fields of the different manufacturers, a comparison of the different devices available on the market, complete profiles of all the manufacturers' worldwide (including manufacturing facilities) and a clear analysis of the technology trends. Company profiles included in the report : Analog Devices, Applied MEMS, BAE/SSS, BEI Systron Donner, Bosch, Colibrays, Conti-Temic, Dalsa Semiconductor, Delphi, Denso, Honeywell, IMT, Murata, Matsushita, Samsung, Sensor/Infineon, STM, Tronic's Microsystems, VTI Technologies, X-Fab.

Contact to have more information or to purchase the report:

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## Company's Report

### An SOI solution dedicated to the MEMS market

Umicore, an international Group, involved in the production, recycling and marketing of metals and materials, proposes new SOI wafers for MEMS applications. Umicore Semiconductor Processing (USP) dedicated to MEMS solutions, is located in Boston, USA.

In the second half of the nineties USP was acquired by Umicore. USP's core capability is the production of Si wafers with very tight geometrical specifications. In 2002, the development of Silicon-on-Insulator (SOI) wafers started targeting new solutions for MEMS devices. Umicore's SOI wafers can be used for pressure sensors, inertial sensors, optical switches ...

USP's wafers are bonded thick-film SOI substrates with high added-value: they offer tight control on device layer total thickness variation, a device layer 'perfect edge' and a polished or lapped & etched backside surface.

USP is working closely with its customers to develop specific solutions. The Company has to take into account customer's stringent requirements for engineered substrates such as resistivity, flatness, thickness variations....

#### SOI Main Characteristics

|                              |  |
|------------------------------|--|
| Wafer diameters              | 50 – 150 mm                              |
| Device Layer materials       | CZ or FZ                                 |
| Device Layer orientations    | Any orientation                          |
| Device Layer thickness       | >1.5µm for 50-100 mm, >2.0 µm for 150 mm |
| Device Layer TTV             | <1.0 µm for 50-150 mm                    |
| Buried oxide (BOX) thickness | 0.1 to >2µm (1.0 ±5%µm standard)         |
| Handle wafer materials       | CZ or FZ                                 |

Contact:

Mr Ed Curtin, Sales Manager, ed.curtin@umicore.com

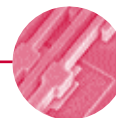
Mr Carl Quaeyhaegens, General Manager, carl.quaeyhaegens@umicore.com

Phone: + 1 617 960 5911

<http://www.substrates.umicore.com>



Please note that the website of Umicore is <http://www.substrates.umicore.com>



# World MEMS FAB 2004, <sup>the</sup> Exhaustive DATABASE on MEMS FAB

**For 1,300 Euros, get up-to-date key information on MEMS fab worldwide**

Available on a CD-ROM, World MEMS fab ("WMF") contains a description of more than 300 fabs for MEMS worldwide, in Excel® format. World MEMS Fab is an invaluable tool for business and marketing managers of the MEMS industry. It gives a complete overview of worldwide facilities. In a user-friendly format, it allows search and statistics for customer's identification and market/technology trend analysis. Along with the World MEMS Fab CD-ROM, you will benefit from an automatic subscription to Micronews, the Yole Développement monthly magazine on MEMS, biochips/microfluidics, nanotechnologies, optoelectronics and semiconductors.

World MEMS Fab provides, for each MEMS fab, information on the following categories:

- Fab name
- MEMS marketing manager contact
- Fab manager contact
- Fab address
- MEMS sales for 2001, 2002 and 2003
- 2004 MEMS sales forecast
- Current staff in production
- Clean room class
- Clean room size (front-end and back-end)
- MEMS products
- Technologies
- Wafer size
- Production capacity



Contact for more information or to purchase the CD Rom:

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## Life & Death

### Micralyne scientist wins silver medal award

Micralyne Inc., a MEMS manufacturer, announced that Project Scientist, Dr. Siamak Akhlaghi, has received a Silver Medal Award from the American Electroplaters and Surface Finishers Society (AESF). Dr. Akhlaghi was presented the Abner Brenner Award, for the second straight year, for the best paper published in the Plating and Surface Finishing Journal during the year 2003. The general topic of Dr. Akhlaghi's paper is the electroplating of gold-tin eutectic solders, which are used for packaging microelectronic and optoelectronic devices because of their excellent thermal and mechanical properties and relatively low melting or reflow temperature. The award winning paper, Effect of Processing Parameters on the Electroplating of Au-Sn Solders, focuses specifically on a co-electroplating process that has been developed for depositing Au/Sn alloys, from a slightly acidic, chloride-based solution using pulsed currents, onto patterned or blanket metallized ceramic and semiconductor substrates.

<http://www.micralyne.com>

### IntelliSense goes fabless

IntelliSense (formerly Corning IntelliSense), a supplier of solutions for the MEMS professional operates now as a Fabless MEMS company and offers design, IP licensing and consulting services. Intellisense has formed strong affiliations with established MEMS foundries and research institutions throughout the United States and the world. These organizations allow Intellisense to prototype and transfer MEMS based components into production at the lower cost.

IntelliSense is the a supplier of solutions for the MEMS professional. Its IntelliSuite® family of CAD tools ignited the MEMS industry in the 90's and is now used by leading corporations and universities worldwide with users in over 20 countries and partnerships with dozens of leading MEMS research institutes

<http://www.intellisensesoftware.com>



## Business News

### Tegal received endeavor AT PVD tool order

Tegal Corporation announced that a leading maker of consumer electronics has placed an order for an Endeavor AT™ PVD cluster tool. The Endeavor system will be used for high-volume fabrication of FBAR (Film Bulk Acoustic Resonator) devices destined for mainstream consumer and industrial wireless communication applications. FBAR devices are an important new type of RF MEMS device used for controlling the wireless signals going into and coming out of radio frequency-based communication devices like cellphones and wireless networking cards. FBAR devices have important performance advantages over the Surface Acoustic Wave (SAW) filters they supplant, including having the ability to handle higher RF power levels and higher frequency applications, less temperature sensitivity and smaller size. The order was placed after rigorous qualification tests, where the Endeavor out-performed all competitors in this advanced and highly technical application.

<http://www.tegal.com>

### MEMSTech planned increase of capacity production raising money

MEMS Technology Bhd, provider of MEMS foundry services and scheduled for listing on Mesdaq market mid-August, is allocating RM20mil to RM30mil to set up a plant in Johor or Malacca by the year's end, according to director Ooi Boon Leong. The manufacturing facility would use a special type of packaging technology to package three-dimensional silicon wafers used in sensors,

accelerometers and silicon microphones developed from micro-electronics-mechanical systems (MEMS) technology. The three-dimensional silicon wafers, sensors, accelerometers and silicon microphones are manufactured by the group's facilities, SensFab and SenzPak, in Singapore.

At the end of June, the company has announced that it expected to raise money planning an initial public offering this summer on Malaysia's Mesdaq market. Memstech expected to raise about \$15 million, which would go to boosting production capacity as well as research and development.

<http://www.memstech.com>

### MEMSCAP announced consolidated results for 2nd quarter and 2nd half 2004

MEMSCAP, provider of innovative solutions based on MEMS (micro-electro-mechanical systems) technology, announces its revenue and operational results for the second quarter and first half of 2004. Second quarter consolidated revenue amounted to 2.8 million euros (3.4 million US dollars), representing a 58.4% growth in euros compared to second quarter 2003 and a 42.3% compared to first quarter 2004, thus leading to revenue of 4.8 million euros (5.8 million US dollars) for the first half of 2004, compared to 3.8 million euros first half 2003 (4.2 million US dollars). According to MEMSCAP, the first achievements are in line with the Group strategy of a return to operational profitability within the second half of the year. This strategy is supported by a to-date backlog of 4.6 million euros of orders to be delivered within the second half as well as by maintaining the cost reduction policy as evidenced by the shut-down of the German office and the Egyptian operations.

<http://www.memscap.com>

## Alliances & Mergers

### LioniX appoints Bigtec as partner in India

LioniX, a Europe-based player in integrated optics and microfluidics, has appointed bigtec as their representative in India. LioniX manufactures microsystems based on integrated optics & microfluidics for its OEM customers, for use in their next generation products. LioniX partners with MST/MEMS foundries and suppliers of complementary technologies, to provide customers with complete solutions and the capability to produce these components from small to very high volumes. LioniX is a privately held company based in Enschede, The Netherlands. Bigtec is a Software Solution provider and has been partner for IntelliSense Software Corporation, U.S.A for "IntelliSuite"- the MEMS Design Tool.

<http://www.lionixbv.nl>

<http://www.bigtec.org>



## How is MEMS Industry Group (MIG) uniting the MEMS industry ?

**SL:** MIG is involved in different groups with a common objective: the commercial development and the use of MEMS devices. Could you present us your organization and its activities?

**EMD:** MIG is the premier trade association for the MEMS and microstructures industries. Since our beginning in January of 2001 with 6 charter members, MIG has grown to include almost sixty members from a wide cross-section of US and international MEMS designers, equipment manufacturers and material suppliers. MIG works with a variety of industries including biotech, biomedical, pharmaceutical, informatics, and industrial controls...

MIG is unique from other MEMS organizations because the core of its membership consists of companies with established and commercialized products who have already evolved beyond the R&D or laboratory phase of development. MIG works with each company to address their individual needs through advocacy, integration, support, networking and relationship building.

**SL:** According to MIG, what are the key technological developments done in the MEMS field in 2003?

**EMD:** According to our membership and our Executive Director, Cleo Cabuz, Ph.D. of Honeywell, the end of 2003 and 2004 have brought significant increase in the interest for MEMS-based products. After the fading of the Telecom hype, companies have come back to many applications where MEMS makes the difference in the value offered to the user. Major developments would be:

- Developments in the reliability/lifetime of RF switches
- Major advancements toward the demonstration of a MEMS-based atomic clock or the demonstration of tactical grade MEMS gyros; good promise of development of a grade MEMS gyro
- Commercialization of biological detection systems which include MEMS elements

**SL:** MIG organizes the annual conference METRIC. Could you tell us more about it?

**EMD:** Each year MIG addresses a single issue affecting MEMS-driven companies. Discoveries from an industry-wide research project and the annual METRIC (MEMS Technology Roadmap and Industry Congress) working conference are used to

create an annual industry report. This year's area of research is accelerated lifetime test (ALT.) METRIC 2004 will take place on September 29-30 at the Pittsburgh Renaissance Hotel. We are currently working on an industry-wide survey and other research that will be used during METRIC 2004 to develop recommendations for overcoming common barriers of ALT. Past MIG industry reports include; Focus on Reliability in 2003, Focus on Fabrication in 2002, and State of the Industry 2001.

**SL:** MIG gathers a lot of industrial members; how do you organize the collaborations with them?

**EMD:** MIG is a single source for answers and a forum to share non-proprietary manufacturing and business information for the goal of overcoming commercialization barriers. MIG motivates companies to work together in a neutral environment for the prosperity of the entire industry.

In addition, MIG offers exceptional networking opportunities. By taking a horizontal approach to industry unity and progress, MIG has helped device designers find their foundries, foundries find their equipment suppliers, and users/integrators find MEMS solutions from device manufacturers.

**SL:** MIG is well known in the North American MEMS industry. What are the objectives of your association in the near future?

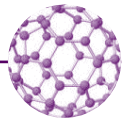
**EMD:** Recently, MIG has begun Phase II of its MEMS Cost Assessment Tool (CAT). MEMS CAT estimates the cost of developing and manufacturing a MEMS product. The MEMS CAT tool will assist MEMS companies in determining the cost to produce a MEMS device before it is developed, thus determining if the project is financially feasible. Phase I determined that there is sufficient interest in a cost assessment tool and such a tool would be of great value to MEMS companies. Phase II of the project will accomplish the evaluation and procedure for developing MEMS CAT. MIG looks forward to the release of the tool in 2005. Also we will release our Focus on Accelerated Lifetime Test Industry report in February of 2005.

Our main objective is to always be a resource that is dedicated to the commercial success of MEMS companies.

### Contact:

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[emcdevitt@memsindustrygroup.org](mailto:emcdevitt@memsindustrygroup.org)  
<http://www.memsindustrygroup.org>





## Carbon nanotube industry sees encouraging signs

Companies in the carbon nanotube (CNT) business are realizing the importance of expanding their manufacturing capacity in order to enjoy the benefits of greater demand through reduced prices, according to research from Frost & Sullivan.

"Limited capital, uncertainty of incremental demand and ambiguity clouding the return on investment delayed the initial decision to increase production capacity; however, positive signals on CNT adoption from various application segments are encouraging companies to strive for refinement in manufacturing processes and maximize their production yields," said Frost & Sullivan Senior Research Analyst Deepa Doraiswamy. Frost & Sullivan found that revenue in the CNT industry totaled \$35 million in 2003 and is projected to reach \$540 million by 2007.

Mass production faces the challenges of complexity and costs, the impact of which is felt more in the single-walled carbon nanotubes (SWCNT) market than in multi-walled carbon nanotubes (MWCNT) market. Despite its higher price margins, SWCNT are gaining prominence in applications that demand high purity and faster response times.

<http://www.frost.com/prod/servlet/frost-home.pag>

## Prince Charles talks about his nano-views

The UK's Prince Charles has spoken out again on nanotechnology. Writing in The Independent on Sunday newspaper, Charles detailed his concerns that society won't pay proper attention to the risks the technology may bring. "Discovering the secrets of the universe is one thing," he said, "ensuring that those secrets are used wisely and appropriately is quite another." With this in mind, the prince says he is delighted that the Royal Society and Royal Academy of Engineering are conducting a study on nanotechnology. The results of that study, which began in June 2003, are due out imminently.

## Tailored Materials, US, has raised \$2 m in a first round of private financing

Founded in mid-2004, the company makes carbon double-wall nanotubes for field-emission displays and other devices - it says it will use the cash to commercialize and scale up its technology. "Double-wall nanotubes, which our patent defines as nanotubes with two to five walls, offer performance that is equal or better than single-wall nanotubes for conduction and emission of electrons, but show significantly longer useful lifetimes," said Chuck Hassen, VP business development at Tailored Materials.

<http://www.tmcnanotech.com/>

## Announcement

# Present situation and forecasts in nanotechnology in materials, health and medical systems, energy

Rome, Italy, November 4th- 5th, 2004

The international 2-days conference offers the opportunity to present the 1st results of the Nanoroadmap project (NRM). NRM is a project co-funded by the European Commission within the 6th Framework Program (FP6). Started in January 2004, it has as objective to provide coherent scenarios and technology roadmaps up to 2014 for the applications of nanotechnology in three selected fields : materials, health and medical services, energy. The Conference will be a two days event and it will cover the following topics:

- Nanotechnology in the world today: national activities, policies and initiatives;
- Present situation and forecasts of nanotechnology and its applications in: materials ; health and medical services ; and energy.
- Panel discussion on the future roadmapping exercise.

Several well-known experts of both the research and industrial communities are expected to participate and contribute to enrich the discussion. A dedicated poster session will offer the opportunity to present recent developments and applications in nanotechnology in the 3 fields.

Co-ordinator: AIRI / Nanotech IT ,

Partners: Willems & van den Wildenberg, VDI/VDE-IT, VTT, Institute of nanotechnology, Matimop, Technology centre, Yole Développement

Please submit your title and abstract of maximum 400 words before the 20th August 2004.

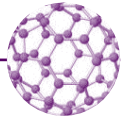
Room will be available for exhibitors to showcase their products and developments and opportunities for sponsorships and advertising.

For more information, please contact: AIRI/Nanotec IT, Mr Elvio MANTOVANI

Tel: +39 06 854 66 62 or +39 06 884 8831 Email: [info@nanoroadmap.it](mailto:info@nanoroadmap.it)

[www.nanoroadmap.it](http://www.nanoroadmap.it)





## Techno News

### Nanotechnology makes the right connections

The new field of nanotechnology can now produce wires with diameters a scant few hundreds of millionths of an inch in diameter, a hundred or so atoms across. You can't even see wires that small; you need a sophisticated electron microscope. In a basement laboratory at Harvard University, Charles Lieber and his students have solved this problem. They have taken the first step toward making chips with billions instead of millions of components, nanoelectronics instead of microelectronics.

<http://www.news.harvard.edu/>

#### GE claims top nanotube diode

GE Global Research says it has developed the world's best performing diode built from a carbon nanotube, which could someday enable smaller and faster electronic devices with increased functionality.

One possible application for the device is to build the next generation of advanced sensors that will have unsurpassed levels of sensitivity. For example, next generation sensors in security applications could detect potential terrorist threats from chemical and biological hazards, even if they are present in extremely small quantities. This would enable enhanced security at airports, office buildings, and other public areas.

The carbon nanotube diode was developed by Dr. Ji-Ung Lee, a scientist who works in the Nanotechnology Advanced Technology Program at the GE Global Research Center in Niskayuna, N.Y. More research is underway to enhance the carbon nanotube diode and increase the yield in the manufacturing process, but researchers believe this breakthrough could enable a range of important new applications in computing, communications, power electronics, and sensors.

[www.crd.ge.com/](http://www.crd.ge.com/)

#### Oregon team uses DNA as template for organizing nanoparticles

Researchers at the University of Oregon's Oregon Nanoscience and Microtechnologies Institute (ONAMI) are now able to control precisely the spacing between nanoparticles, a key advance in the genesis of a new class of nanoscale electronics and optics.

The process has been developed by UO chemistry professor James E. Hutchison together with two of his students, Gerd H. Woehrle and Marvin G. Warner.

Using DNA as a template, the UO team has hit upon a convenient and reliable method to organize small gold nanoparticles into linear chains with precisely controlled interparticle spacing over a range of 1.5 to 2.8 nanometers. Controlling the magnitude and precision of the particle spacing is essential for creating electronic and optical applications of nanostructures.

<http://www.onami.us/>

### EV Group unveils NanoAlign Technology, new mask aligner at SEMICON West

EV Group, a leading supplier of wafer-bonding and lithography equipment, today announced that it has developed an advanced aligner technology that improves competitiveness of full-field lithography by providing the industry's highest alignment accuracy and resolution at lowest cost of ownership. The new NanoAlign Technology features active run-out control and sub-100nm dynamic alignment resolution, complemented by UV-Nanoimprint (UV-NIL) capability.

[www.EVGroup.com](http://www.EVGroup.com)

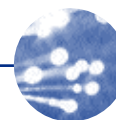
## Alliances & Mergers

### BAE and Nantero in joint evaluation of carbon nanotube-based electronics

Nantero and BAE Systems are to jointly evaluate the potential to develop carbon nanotube-based electronic devices for use in advanced defence and aerospace systems. The project will involve research and development of a variety of next-generation electronic devices that can be built using the unique properties of carbon nanotubes and using Nantero's proprietary methods and processes for the design and manufacture of nanotube-based electronics.

<http://www.nantero.com/>

<http://www.na.baesystems.com/>



## Alliances & Mergers

### OFC and NFOEC merge

The executive management of the Optical Fiber Communication Conference and Exposition (OFC) and the National Fiber Optic Engineers Conference (NFOEC) today announced plans to combine the two events into one comprehensive conference and trade show exposition to take place March 6 -11, 2005 at the Anaheim Convention Center in Anaheim, CA.

<http://www.ofcconference.org/>

### Nortel Networks sells manufacturing operations to Flextronics

Nortel Networks has reached an agreement with Flextronics regarding the divestiture of certain Nortel Networks manufacturing operations and related activities in Canada and Brazil. It is also anticipated that Flextronics will acquire Nortel Networks manufacturing operations in France and Northern Ireland, subject to the completion of the required information and consultation process. These operations and activities have been the subject of discussions between the two companies since Nortel Networks announced in January 2004 that it was in discussions with Flextronics.

<http://www.nortelnetworks.com/index.html>

<http://www.flextronics.com/>

### Hitachi, NEC team up to form router company

Hitachi and NEC are joining forces to establish a new company specializing in backbone routers and switches. The joint venture company will be set up in October 2004 with a capital of around Yen 5.5 bn (\$51m) and will employ about 350 staff from both firms. The new business, which will be located in Tokyo, Japan, intends to provide highly competitive products for the networks of telecommunications carriers, government and public sectors, and large corporations. Hitachi will own 60% of the company while NEC will own 40%. The joint venture will supply products to Hitachi and NEC, who will market them to their individual clients.

<http://www.hitachi.com/>

<http://www.nec.com/>

### Thales and Alcatel form III-V research lab

Thales and Alcatel have created a joint research laboratory in France dedicated to III-V semiconductor technologies, targeting applications in telecommunications, defense, space and security. With about 100 researchers, the lab expects to be a major European player for industrial research in the field of III-V components. The main fields of research are optoelectronic and microelectronic components for optical fiber transmission (InP HBT circuits, laser sources, modulators and photodetectors), GaN-based high-frequency, high-power transistors and circuits, infrared imaging photodetectors and high-power laser diodes.

The laboratory, known as the Alcatel-Thales III-V Lab, will re-enforce both companies' expertise in the field of optoelectronic and microelectronic components based on III-V technologies.

<http://www.thalesgroup.com/home/home/index.html>

<http://www.alcatel.fr/>

### Aixtron joins LED-on-silicon project

Aixtron has joined a Belarus-based project investigating LEDs fabricated on silicon substrates, a technology with the potential to dramatically reduce global energy consumption. The three year program will investigate whether silicon can replace either silicon carbide or sapphire, both more expensive substrates, as the first choice for LED production. Success could lead to a reduction in LED prices, and consequently an increase in the LED market for general lighting applications. Many nations today run LED-based solid state lighting (SSL) projects. Benefits of SSL include low energy consumption and infrequent replacement of the source, due to the very long lifetimes associated with LEDs. The project, funded by the International Science and Technology Center in Russia, will be undertaken in the Laboratory of Semiconductor Optics, Stepanov Institute of Physics of the National Academy of Sciences of Belarus.

<http://www.aixtron.com/>

### NIF Venture acquires a stake in Varioptic SA

Varioptic S.A., the company based in Lyon, France, inventor of the Tunable Liquid Lenses, and NIF Ventures Co (Japan) have signed an agreement whereby NIF Ventures acquires a stake in Varioptic S.A.

Sofinnova Partners and PolyTechnos, who jointly led the last round of series B financing last March, welcome the arrival of NIF which will further strengthen Varioptic's financial position and facilitate its entry into the key optical Japanese market. Mobile phones are the main market for Varioptic's revolutionary lens. Currently, you can rarely find a mobile phone with an auto focus camera, not to mention a zoom feature. But as the quality and the definition of the pictures are evolving rapidly, the trend is to switch from VGA sensors (640 pixels wide by 480 pixels tall) to mega pixels sensors (more than 1200 pixels wide). Auto focus is becoming a necessity and is hardly implementable by using conventional technologies according to the Lyon-based company. Varioptic's patented Liquid Lens is a key technology to bring auto focus and then zoom to mobile phones, with advantages in terms of dimensions, cost, and power consumption.

<http://www.varioptic.com>

<http://www.nif.co.jp>



## Nichia in patent talks with Taiwanese rivals

While continuing to challenge rival companies that it claims are infringing its patents, Nichia has issued a statement saying that it is looking into the possibility of licensing its technology to certain Taiwanese LED manufacturers. So far, Nichia has had an uncompromising relationship with its Taiwanese rivals, and has filed injunctions against Epistar, a chip maker, and Everlight, a packaging company. However, Nichia says it is now exploring the possibilities of alliances with certain Taiwanese manufacturers, in order to secure growing global demands for its products, and in accordance with its IP policy.

<http://www.nichia.com>

## Osram accuses Dominant over LED patent

Osram Opto Semiconductors has filed a complaint alleging that LED manufacturer Dominant has infringed upon its technology patents. The complaint, filed with the United States international trade commission, comprises two basic technologies. The first group covers technology that enables LEDs to emit white light from a single semiconductor chip. Applications for these LEDs include backlighting for cell phones and automobile dashboards. The second group of patents concerns technology for electrical connection structures used in LEDs, including high-power LEDs for automobile lighting applications, such as interior lighting and rear combination light systems. Osram has requested an order to prevent a wide range of Dominant's LEDs, and products containing them, from being imported to the US.

<http://www.osram.com/>

## Bookham targets industrial laser market

Bookham Technology is to focus on the high-power industrial laser market with a range of GaAs-based products manufactured at its Zurich, Switzerland, facility. The company has adapted its 980 nm telecom lasers to emit at other wavelengths, including 808 nm, which is more suitable for optically-pumping high-power lasers based on certain rare-earth-doped crystals. Bookham says that a 60 W laser bar emitting at 808 nm has now been qualified after 5000 hrs of testing, and it expects to release further products emitting 80 W and 120 W by the end of this year. After data storage and telecoms, industrial lasers represent the third-biggest application sector in the market for laser diodes. The market for them is expected to grow 14% to reach \$135 million in 2004, according to a report by Strategies Unlimited published earlier this year.

<http://www.bookham.com>

## Highwave Optical Technologies announces its results for the fiscal year 2003-2004

Highwave Optical Technologies (Nouveau Marche, HGWO), a leading technology supplier of active fibre based components and subsystems for the telecommunication Dense Wavelength Division Multiplexing (DWDM) systems, fibre laser industry, fibre optic sensors and defence markets, announced today its results for its fiscal year 2003-2004, ended on March 31, 2004.

Financial results for fiscal year 2004: The Company achieved sales of EUR 3, 3 million. EUR2, 7 million of sales (82%) came from international activities. Net loss amount to EUR14, 3 million and operating loss to EUR12, 2 million, decreasing of 57% and 46%, respectively, compared to the previous year.

<http://www.highwave-tech.com/>

## Kotura raises \$11 million for silicon CMOS development

Kotura Inc., developer of Silicon Opto-Electronic Integrated Circuits (SOEIC), today announced that it has secured \$11million in funding from existing investors, ComVentures and ARCH Venture Partners. "We are very fortunate to have the support of such exceptional venture capital firms, ComVentures and ARCH Venture Partners," contends Jean-Louis Malinge, CEO of Kotura. "This new round of funding is a strong endorsement of the progress we have made to date and the belief of our investors in the future of silicon as the ultimate platform for the integration of photonics and electronics. With this additional investment we can continue to leverage the advantages of silicon CMOS technologies to develop next-generation opto-electronic technologies and products," he says.

<http://www.kotura.com/>



## Toshiba introduces high-speed photocoupler

In an effort to meet increasingly stringent isolation and switching requirements of intelligent power modules, industrial inverters and similar applications, Toshiba America Electronic Components (TEAC), based in Irvine, CA, have introduced a high-speed, high-gain photocoupler that supports signal transmission and switching speeds up to 400ns. Developed by Toshiba Corporation and designated TLP106, the new device is intended for signal isolation in intelligent power modules, industrial inverters, and motor drives. The small 6-pin package is ideal for space constrained applications. The TLP106 photocoupler is an optically coupled isolator consisting of an AlGaAs LED and an integrated high-gain, high-speed photo detector. The new device offers an extremely low propagation delay of 400ns, high isolation voltage of 3.75kV(rms), common mode transient immunity of 10kV/ $\mu$ s, and threshold input current requirements of 3mA.

<http://www.toshiba.com/taec/>

## Panasonic launches Blu-ray disc/DVD recorder

Matsushita Electric Industrial, based in Osaka, Japan, and best known for its Panasonic brand products, has unveiled the DMR-E700BD, a Blu-ray disc/DVD recorder. The company claims that the model is the world's first DVD recorder that supports single-side, dual-layer Blu-ray discs with a maximum capacity of 50Gb. The DMR-E700BD can record either up to 4.5 hours of digital high-definition (HD) programming or up to 63 hours of analog programming. It supports both DVD-RAM and DVD-R discs, so users can choose the most appropriate media for their recording needs. Competition to the DMR-E700BD comes from Sony, NEC and Toshiba. Sony was first on the market over a year ago with a machine capable of recording up to 23Gb, while Toshiba and NEC have both demonstrated prototypes recently.

<http://www.panasonic.com/static.html>

## Waveguides offer higher level of integration

Danish scientists have come up with a new take on silica-on-silicon waveguides - one that will help to reduce the waveguide's bending radius and enable a higher level of integration within optical devices. Traditionally, silica-on-silicon waveguides use a germanium-doped core with an index contrast of around  $\Delta n = 0.01$ , which provides good mode matching with optical fibre but limits the bending radius to about 1 cm. Now the Research Center COM at the Technical University of Denmark has developed optical waveguides with an index contrast of  $\Delta n = 0.62$ , which enables much tighter bending radii. The COM team deposited amorphous silicon-rich silicon nitride on oxide-coated silicon wafers to create the high-index-contrast waveguides.

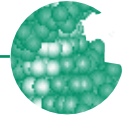
<http://www.com.dtu.dk/>

## Life & Death

### High-speed photodetector based on GOI from IBM

IBM has developed a high-speed photodetector based on a germanium-on-insulator (GOI) technology that could allow ready incorporation into standard chipmaking processes. The company hopes for applications designed to greatly increasing the speed at which information travels to and from microchips over optical connections. Existing silicon (Si) photodetectors are inadequate for the speeds needed for optical interconnects. The new detector is compatible with standard microchip technology because the germanium can be placed selectively in the regions where the photodetectors reside. This compatibility opens the door for making opto-electronic circuits on the same chips as microprocessors and other electronic components. IBM says that the photodetectors exhibit nearly all of the desirable properties needed for optical interconnects - high bandwidth (speed), high efficiency (40%), low voltage operation (1V), wide spectral window and compatibility with standard microchip fabrication facilities.

<http://www.ibm.com>



## Announcement

# IBC Life Sciences presents 11th annual Chips to Hits<sup>®</sup>, applications & technologies to advance all stages of drug discovery, development and diagnostics

September 20-23, 2004 - Seaport World Trade Center, Boston, MA, USA

<http://www.chipstohits.com/default.asp?source=2950MN>

Chips to Hits<sup>®</sup> 2004, now in its eleventh successful year, combines a multi-track format focused on providing the highest level of quality in science, networking and information exchange. The event is designed for a cross-disciplinary audience with subject matter ranging from scientific innovation and advancement to business and legal opportunities/challenges through to interactions with government agencies.

This is the only microarray and microtechnology event in the world that provides access to the full spectrum of new technology, unpublished data, and applications in discovery, development and diagnostics, plus the ability to network with over 1400 attendees.

Hear From Over 100 Industry Leading Speakers Including:

- Dr. Robert H. Austin, Princeton University
- Dr. Matthew Cooper, Biogen Idec
- Dr. Shawn T. Estrem, Eli Lilly and Company
- Dr. Larry Gold, SomaLogic
- Dr. Winston Kuo, Harvard Medical School
- Dr. Conan Li, Quest Diagnostics
- Dr. David E. Millhorn, University of Cincinnati
- Dr. Spyro Mousset, Translational Genomics Research Institute
- Dr. David L. Rimm, Yale University
- Dr. Mark A. Rubin, Harvard Medical School
- Dr. Mark Schena, TeleChem International, Inc.
- Dr. Paul J. Utz, Stanford University School of Medicine
- Dr. Werner Zolg, Roche Diagnostics GmbH, Germany

View Complete List of Speakers:

<http://www.chipstohits.com/default.asp?view=speaker&source=2950MN>

19 Sessions Featuring The Latest In Applications, Technology, And Business Strategies:

- DNA, Protein, Cell, and Tissue Arrays
- Microfluidics and Nanotechnology
- Next-Generation Technologies and Informatics
- Biomarkers for Drug Efficacy, Toxicity, and Diagnostics
- Target Discovery and Validation
- Disease-Specific Applications
- Business Opportunities and Paths to Commercialization

View Complete Agenda, including detailed abstracts:

<http://www.chipstohits.com/default.asp?view=schedule&source=2950MN>

Access to Over 1,400 Attendees, 100 Scientific Posters, and 100 Exhibit Booths:

- Unparalleled Networking Only at Chips to Hits<sup>®</sup>

For further information:

IBC Life Sciences  
1 Research Dr Ste 400A  
PO Box 5195  
Westborough MA 01581-5195 USA  
Phone: +1 (508) 616 5550 ext.1004 phone  
Fax: +1 (508) 616 5533

The World's Largest and Most Comprehensive  
Microarray and Microtechnology Conference

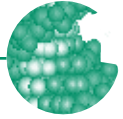
IBC's 11th Annual International

# CHIPS TO HITS<sup>®</sup>

## 2004

September 20-23, 2004  
Seaport World Trade Center  
Boston, Massachusetts

[www.chipstohits.com](http://www.chipstohits.com)



## Alliance & Mergers

### Codevelopment between Takara Bio and Hitachi based on Anthrax Screening System

Mid July, both companies announced their collaboration to jointly develop a new screening system for anthrax detection. The final solution will be based on Takara Bio's gene amplification method Isothermal and Chimeric primer initiated Amplification of Nucleic acids (ICAN) and Hitachi's MEMS technique. It will be a microchip system that will have an ICAN reagent. The collaboration will last two years.

<http://www.hitachi.co.jp>

<http://www.takara-bio.co.jp>

### Comarketing agreement between Combimatrix and Strand Genomics

This alliance is based on the commercialization of Strand Genomics product, a data analysis software tool for microarray gene expression, named Avadis. It is a data analysis and visualization tool that combines scalable analytical algorithms with powerful and interactive visualization to derive valuable insights from gene expression data. This new tool will enable customers to seamlessly order, redesign and record CustomArrays.

<http://www.combimatrix.com>

<http://www.strandgenomics.com>

### Evotec Technologies will collaborate with Till Photonics

Aim of this collaboration is to provide Evotec with a microscopy platform based on Till Photonics' technology, iMIC' for complete range of products. Till Photonics GmbH develops, manufactures and supplies innovative components and turn-key solutions for fluorescence microscopy. The iMIC technology has been developed thanks to a partnership with the Bioluminescence Center of the LMU (Munich, Germany); it is now in its second stage of evolution.

Evotec's instruments are mostly deployed in pharmaceutical drug discovery and life science industries.

<http://www.till-photonics.com>

<http://www.evotec-technologies.com>

### License agreement between Pamgene and the University of Nottingham

Pamgene International announced mid-July, the licensing of its 3-Dimensional Flow-Through Microarray Platform to Nottingham University, England. This license includes the sale of a Pamgene 4-array PamStation' and will enable the University to develop Multiplex Amplifiable Probe Hybridization (MAPH) as a service on the Pamgene platform.

The university, with this new solution, will have the ability to automate their MAPH tests in a microarray format, using the 30-minutes hybridization procedure offered by Pamgene's 3-dimensional flow-microarray technology.

<http://www.pamgene.com>

### Beckman Coulter and PointCare Technologies announce a strategic alliance

Under this agreement, Beckman Coulter has exclusive global sales and marketing responsibilities for the new PointCARE' system, small enough for use at the point of care for monitoring drug therapy in HIV/AIDS patients. PointCare Technologies will ensure the R&D steps. Details of this agreement were not disclosed.

<http://www.pointcaretechnologies.com>

<http://www.beckman.com>

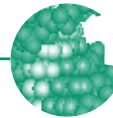
### Commercial agreement between Affymetrix and Nimblegen Systems

Affymetrix will commercialize new customized NimbleExpress' Arrays manufactured by Nimblegen. The final product combines the flexibility of Nimblegen's photolithographic Maskless Array Synthesis (MAS) technology with the reproductibility and ease of use of Affymetrix GeneChip, system including reagents, instrumentation and analysis software. This solution is suited for custom experiments or pilot studies.

Under this agreement, Affymetrix will commercialize made-to-order NimblegenExpress Arrays for use on Affymetrix GeneChip instrument systems.

<http://www.affymetrix.com>

<http://www.nimblegen.com>



## New Products

### Affymetrix's DNA chips used for SIDS, autism

The GeneChip Mapping 10K was used to discover a gene linked to one form of sudden infant death syndrome, SIDS. The Translational Genomics Research Institute (TGen) located in Phoenix and the Clinic for Special Children in Strasburg, MA, identified the location of the disorder to a particular chromosomal region. Next steps will be to examine the effects of the gene on the normal control of breathing and heart rate in normal but premature infants.

<http://www.affymetrix.com>

### Combimatrix launches a human toxicology expression array

Combimatrix's solution utilizes the most recent information regarding genes that are relevant to the study of toxicology. This array contains 12,000 probes to genes that were selected from the scientific literature and public database. With the help of Combimatrix's flexible CustomArray' technology, the chip will be periodically up-dated.

Benefits of Combimatrix's technology are numerous: very rapid design and fabrication of new types of arrays. Combimatrix's array is dedicated to the pharmaceutical research.

<http://www.combimatrix.com>

### Ciphergen develops a new system to speed the process of biomarker discovery to assays

The US Company launches its next generation ProteinChip, System, Series 4000. According to Martin Verhoef, President of Biosystems Div. at Ciphergen Biosystems, the major bottleneck in proteomics is the development of validated biomarker assays. This new solution was specifically designed to speed the biomarker discovery to assay process and produce high predictive SELDI-based assays in weeks versus months or years. These assays include disease diagnosis, prognosis, and prediction of drug response or understanding of biological function.

<http://www.ciphergen.com>

## Business News

### Synthetic DNA business for sale

At the end of June, Qiagen announced that it has sold its synthetic DNA business to a management team previously employed at Qiagen and which operated parts of this business. Qiagen keeps a minority stake of 15% and the last part is backed by private investors. The new Company, named Operon Biotechnologies, will continue its activities.

<http://www.qiagen.com>

### A Japanese application development center for Tecan

Tecan is pleased to announce the establishment of the Tecan Kobe Application Development Center located in Kobe, Japan. This center will be dedicated to the protocol development needs of customers in Japan and Asia. With this new location, Tecan would like to further develop the well-known flexibility and configurability of its products by optimizing protocols and gathering data to validate new solutions.

The Company had many request for new automation ideas that Tecan wanted to pursue but couldn't due to a lack of proof-of-experiment results.

<http://www.tecan.com>

### Early stage drug discovery market is evolving

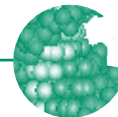
According to Kalorama Information, the market for the tools and services in combinatorial chemistry and high-throughput screening is expected to \$3 billion in 2003, but a dynamic set of challenges are shifting customers focus. These results are coming from a new marketing study realized by Kalorama Information.

The new study, "Early Stage Drug Discovery 2004: Combi-chem and HTS revisited," found that areas such as information technology and newer methods of compound synthesis are showing the greatest

potential growth. In assay development, cell-based assays that emphasize so-called high-content screening and technologies that enable multiplexing are generating the most interest.

According to the study, although big capital expenditures in HTS and UHTS have flattened considerably, sales in certain niche areas are soaring. Discovery-related information technology, for example, is showing approximately 20% growth with certain subsegments such as in silico modeling leading the way with near 40% growth. Other rapidly developing areas include microwave-assisted compound synthesis and chip/array instruments.

<http://www.kaloramainformation.com>



## Company's Report

### Micronit expects a growing demand for microfluidic solutions on glass



The company has developed a strong expertise in microfluidic components on glass substrates. With a large range of micromachining processes, Micronit Microfluidics proposes standard and customized solutions. Indeed, the company doubled its staff between 2003 and 2004.

Mr Micha Mulder, CEO of Micronit, reports us the benefits of glass technologies:

**SL: What is the activity of Micronit today?**

**MM:** We started 5 years ago with support from the University of Twente, but at the moment we are a self-supporting, profitable company. In those 5 years we've worked intensively to build up our technological capabilities and product portfolio.

Our core activity is to provide microfluidic devices from idea to prototype to high volume production. We offer the complete trajectory from idea to prototyping to production, even with providing R&D services if appropriate. The main part of our activity, about 90%, regards customized products of either glass or glass-silicon. Typically, these components' sizes range from 1 to 10 cm<sup>2</sup>, but could stretch to an 8" wafer scale for selected applications.

**SL: What are the key technologies developed by your company and dedicated to glass substrate?**

**MM:** Our technologies include mainly micropowder-blasting, wet etching, direct bonding and integration of metal layers for electrodes. Micronit has also a strong expertise on silicon micromachining but clearly, Micronit's added-value regards glass micromachining.

**SL: Micronit focuses its strategy of development on glass micromachining technologies. Could you explain us the benefits of glass wafers compared to other materials, such as polymer?**

**MM:** Glass has the advantage of being chemically inert, hydrophilic. It has also material properties that are stable in time and it is thus preferable to polymer, for instance, for High Throughput Screening uses. Glass is also superior from an optical point of view, useful with optical detection / analysis methods.

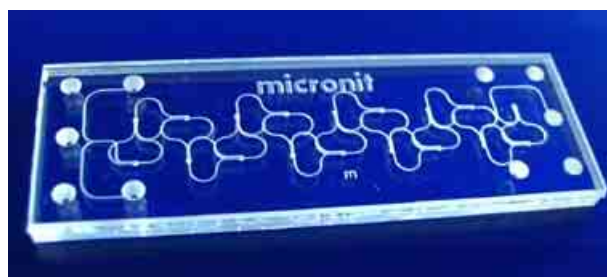
For prototyping purposes glass is often more economical compared to polymers as a result of the flexible de-signing advantages and in very high volumes glass still can be competitive.

Regarding standard chips, prices start at 60 Euros. For customized chips, this price depends significantly on the size, the process, the functionalities and the desired quality (i.e. tolerance). We made chips from 3 per piece up to 10.000 per piece. Mainly through many years of experience, high qualified personell and our IP collaboration with the University of Twente

(MESA+) we are able to provide products with an excellent, very competitive, price / quality ratio. Additional to our own production facilities we can access the modernst, most innovative equipment of the MESA+ to maintain on the innovative edge of microfluidic market.

**SL: Your Company is working closely with its customers to define the most interesting solutions in terms of technology and costs. Could you tell us, who does the corresponding IP belong?**

**MM:** In most cases the developments are done in close collaboration with our customers. We usually agree with our customers that they become owner of the application related IP, and we get the process related IP.



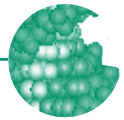
Glass micromixer chip, size 45x15 mm, made from 3 layers of glass

**SL: Micronit has a strong expertise in the European microfluidic market. What is your view on other geographical areas?**

**MM:** To my personal point of view, in North America the initiators of the microfluidic market are start-ups, characterized by a rather open view to new technologies. On the contrary, in Asia, the main players are most likely large companies, which perform R&D internally. At the moment Micronit is collaborating with North American companies and is initiating a reselling point in Japan.

**SL: During 5 years, Micronit's aim was to build up technological capabilities and product portfolio. What will be the next step of Micronit's development?**

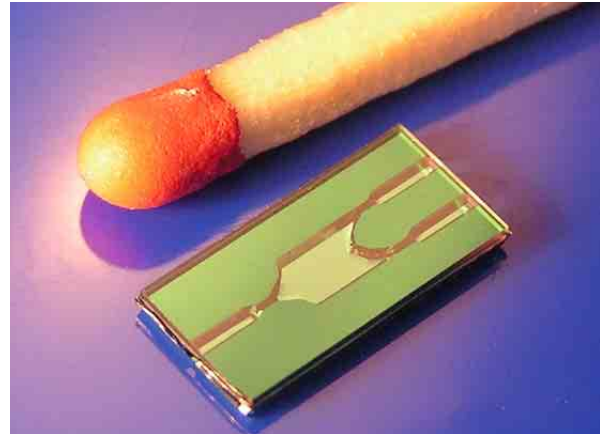
**MM:** We firmly believe that the life sciences and pharmaceutical microfluidics markets will grow in the near future, as there is a lot to be gained by minimizing quantities of fluid, and improving throughput and accuracy.



## Company's Report

At Micronit we are looking closely with our customers for new innovations. Our recent innovations include chips with more than 2 layers of glass, very accurate alignment ( $\pm 1 \mu\text{m}$ ), multiple processes on one sheet of glass, very thin glass ( $< 100 \mu\text{m}$ ). For the near future we intend to go to higher volume production, i.e. more than 100.000 wafers on year. We also do a lot of R&D with our customers, such as chips with functionalized surfaces.

According to me, technological bottlenecks in microfluidics are the interfacing with existing equipment. It is hard to meet the increasing demands concerning pressure, dead volume and materials used for the interconnection. The first step that we have made is the development of an easy to use chip holder for capillary interconnections.



Glass/silicon flowcell for cell analysis

### Contact:

Micronit Microfluidics B.V.

Mr Micha Mulder, CEO, Micha.mulder@micronit.com, +31 53 4836 584

<http://www.micronit.com>

## Announcement

### $\mu\text{Flu}'04$ , December 14-16, 2004 - Toulouse, France

Further to the successful 1st French Congress on Microfluidics in December 2002, the "Société Hydrotechnique de France" organizes this second edition which will be held at INSA Toulouse.

The aim of this conference is to strengthen the links in the scientific community in this young discipline and to promote exchanges between universities and industrial companies. The international broadening initiated at the first congress will be carried on, through papers delivered in French or in English and with invited lectures from foreign researchers.

### Topics developed during the conference

#### - Microflows: fundamental properties

Specific behaviours of microflows found in various basic actions as transport, transfer, dosing, mixing ... will be here studied.

This will concern liquid, gaseous or two phase flows, with or without chemical or biological reactions, in microchannels, more complex microsystems or in the form of microdroplets, modelling, numerical simulation and experimental analysis.

#### - Applications and technologies dedicated to microfluidic components

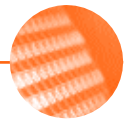
Manufacturing technologies, fluid handling solutions, integrated systems, economical and industrial stakes.



For further information:

[microfluidique2004@insa-tlse.fr](mailto:microfluidique2004@insa-tlse.fr)

<http://microfluidique.insa-tlse.fr/mf04.htm>



## Techno News

### SUSS MicroTec introduced multi-site wafer level reliability test system and announced several orders for other equipment

SUSS MicroTec AG has introduced an analytical probe system dedicated to Multi-Site Wafer Level Reliability (WLR) testing. With integrated devices becoming increasingly complex, the need to ensure that every transistor will last over the IC's lifetime has become almost as important as testing the functionality of the device itself. Reliability tests stress the device over several hours or even days in order to simulate how the device would act under normal conditions throughout its expected lifetime. The SUSS PM8WLR ProbeShield® system is developed for extremely accurate, high-temperature multi-site WLR measurements, such as: electro-migration, TDDDB, hot carrier, wafer level burn-in, life test and/or device characterization. The PM8WLR ProbeShield is a light-tight, EMI shielded probe system which contains a thermal chuck with a temperature range from -60°C to +300°C. The ProbeShield's rinsing system ensures frost-free conditions when probing at negative temperatures.

SUSS also announced several orders : Multiple orders for 300mm wafer bumping equipment from SPIL in Taiwan ; Additional 200mm lithography order from XinTec in Taiwan; Installation of multiple 200mm wafer bumping lithography systems at ASE in Taiwan; Other 300mm wafer bumping lithography systems in Taiwan (including MA300Plus Full Field; Lithography systems and ACS300Plus Coat/Develop wafer-processing clusters).

<http://www.suss.com>

### Infinion and IBM claimed the first 16 Mbit MRAM

Infinion Technologies AG and IBM presented the world's first 16 Mbit Magnetoresistive Random Access Memory (MRAM). This new non-volatile memory chip is the highest density MRAM reported to date demonstrating that MRAM has the potential to become a universal memory for high performance computing and mobile applications. The increasing number of mobile applications such as smartphones and notebooks with additional multimedia features results in the need for more advanced memory chips. MRAM is a promising candidate for universal memory in high-performance and mobile computing as it is faster and consumes less power than existing technologies. The 16Mbit MRAM product demonstrator is realized in a 0.18µm micron logic based process technology. It utilizes a 1-Transistor 1-Magnetic Tunnel Junction (1T1MTJ) cell and features an SRAM-like interface which is prevalent in mobile and handheld applications and well suited to the operation of the MRAM core.

<http://www.infineon.com>  
<http://www.research.ibm.com>

### Agreement on 193-nm immersion lithography tool

International SEMATECH and Exitech have announced an agreement to develop the world's first ultra high numerical aperture (NA = 1.3) 193 nm wavelength immersion lithography tool. This groundbreaking microexposure tool, the MS 193i, will help speed the development of critical infrastructure for immersion lithography at SEMATECH's Immersion Technology Center in Austin, Texas. The Exitech MS-193i tool, due to be installed at SEMATECH during the third quarter of 2005, incorporates a 1.3 NA catadioptric, 0.4 mm field, water immersion imaging objective lens developed by Corning Tropel (Fairport, NY). With a 4k Hz, linearly polarized, 193 nm natural bandwidth ArF laser source from Lambda Physik (Göttingen, Germany), the tool is expected to image minimum feature sizes of 70 nm and 45 nm respectively using binary and phase shifting masks.

<http://www.sematech.org>  
<http://www.exitech.co.uk>

## Life & Death

### Inauguration of 300-mm DRAM facility: Inotera Memories

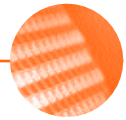
Inotera Memories, a joint venture of Infineon Technologies AG and Nanya Technology Corporation, announced the inauguration of its 300mm semiconductor production facility at the end of June. Inotera will produce memory products at the world's largest and most competitive 300mm DRAM production site with a total capacity of more than 50,000 wafer starts per month when fully operational. The first DRAM chips using 110nm trench technology are already rolling off the new production site located at HwaYa Technology Park, Taiwan.

Inotera's major production volume of memory products will contribute to Infineon Technologies and Nanya Technology Corporation and help each partner to expand its position in the DRAM market.

The 300mm semiconductor facility will be equipped in two stages aligned with the growth and development of the world semiconductor market. By the end of calendar year 2004, more than 20,000 wafer starts per month are planned. The initial production of memory products at Inotera is based on the 110nm process technology; the transition to 90nm is expected to start in 2005.

The total investment of the joint venture amounts to around US-dollar 2.2 billion.

<http://www.infineon.com>  
<http://www.nanya.com>



## Business News

### STMicroelectronics' President and CEO Pasquale Pistorio Appointed to Lead New Advisory Council for the Future of European Nanoelectronics

STMicroelectronics today announced that Pasquale Pistorio, the Company's President and Chief Executive Officer, has accepted the challenge of chairing the Technology Platform group of a new European initiative called ENIAC (European Nanoelectronics Initiative Advisory Council), in which leading European players in the micro- and nanoelectronics field will work together to develop and implement a coherent European vision for the coming nanoelectronics era.

<http://www.st.com>

<http://www.cordis.lu/nanotechnology>

### Freescale Semiconductor and Motorola announced IPO and debt offering and financial results for 2nd quarter

Freescale Semiconductor, Inc. and its parent company, Motorola, Inc., announced the initial public offering of 121,621,622 shares of Freescale Semiconductor Class A common stock at a price of \$13.00 per share, for a total offering of \$1.58 billion. Freescale Semiconductor's Class A common stock will be listed on the New York Stock Exchange under the symbol "FSL."

All of the shares of Class A common stock in the initial public offering are being sold by Freescale Semiconductor.

Freescale Semiconductor also announced the offering of senior debt securities with an aggregate principal amount of \$1.25 billion. The debt securities consist of \$400 million floating rate notes due 2009, \$350 million 6.875% notes due 2011 and \$500 million 7.125% notes due 2014.

Freescale Semiconductor also reported its financial results for the second quarter ended July 3, 2004. Net sales for the second quarter of 2004 were \$1.46 billion, increasing 31% from the second quarter 2003 net sales of \$1.12 billion, and 5% from the first quarter 2004 net sales of \$1.40 billion. Growth in all three of the Company's business segments drove the increase over the second quarter of 2003, including demand for the Company's RF, digital signal processors, communications processors and microcontrollers.

<http://www.freescale.com>

### SEMI mid-year consensus forecast for chip equipment industry

The leading manufacturers of semiconductor equipment expect sales to increase 63 percent this year from the \$22.2 billion posted in 2003 according to the mid-year edition of the SEMI Capital Equipment Consensus Forecast, released by Semiconductor Equipment and Materials International (SEMI) at the annual SEMICON West exposition.

Survey respondents anticipate the industry to sell \$36.2 billion of new chip manufacturing, testing and assembly equipment in 2004. The forecast indicates that, as the semiconductor upturn is sustained, the equipment market will grow 24 percent in 2005 to reach \$44.8 billion. Survey respondents see the cyclic market growth contracting slightly in 2006 before resuming low double-digit growth in 2007 to reach \$48 billion. The SEMI Mid-Year Consensus Forecast projects broad-based strength across the major equipment product segments in 2004. Wafer processing equipment, the largest segment by dollar value, is expected to grow 61 percent to \$23.7 billion. Assembly and packaging equipment market growth of 77 percent to \$2.9 billion is anticipated. The market for equipment to test semiconductors is expected to increase 66 percent to reach \$6.9 billion this year. The market regions of China and Taiwan are expected to see the strongest overall increases, with growth rates in 2004 of 152 percent and 140 percent respectively.

<http://www.semi.org>

### A European vision document has called for increased expenditure on nanoelectronics research in Europe

The "Vision 2020: nanoelectronics at the centre of change" report says that overall spending should double from its current level of 3 bn per year to 6 bn by 2008.

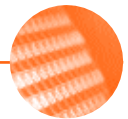
<http://europa.eu.int/comm/research/>

### Intel reports 2nd quarter financial results

Intel Corporation announced second-quarter revenue of \$8.05 billion, approximately flat sequentially and up 18 percent year-over-year.

Second-quarter net income was \$1.8 billion, flat sequentially and up 96 percent year-over-year. Earnings per share were 27 cents, up 4 percent sequentially and up 93 percent from 14 cents in the second quarter of 2003. For the third quarter, Intel is expected revenue to be between \$8.6 billion and \$9.2 billion.

<http://www.intel.com>



## Business News

### Soitec reports record-breaking sales for Q1 2004-2005

Soitec, a manufacturer of silicon-on-insulator (SOI) wafers and other engineered substrates, announced record-high consolidated sales of 32.6 million Euros for the first quarter of its 2004-2005 financial year. Rising semiconductor industry demand across all SOI wafer diameters helped drive a strong 68.3-percent increase in sales compared to the first quarter of the financial year 2003-2004. During the first quarter, wafer sales reached 30.7 million Euros, an increase of 67.2 percent on a year-over-year basis, and 24.6 percent sequentially over the previous quarter. Sales of 300-mm SOI wafers were especially robust, as the industry transition to larger wafers continues to gain momentum. Concerning the first half of the year to September 30, 2004 (to be announced in October), the Group remains on track to deliver strong sales growth both on a year on year and on a sequential basis. The Group is confident that this growth in sales will have a favorable impact on its operating profitability compared to the first half of the prior year. The Group confirms that it expects to achieve breakeven manufacturing margins for 300-mm in the course of its current financial year.

<http://www.soitec.com>

### ASML announces 2nd quarter results

ASML Holding NV (ASML) announced its financial results for the second quarter of 2004 with total sales of EUR 616 million as compared with total net sales in Q1 2004 of EUR 453 million and total net sales in Q2. 2003 of EUR 329 million. Total sales for Q2 2004 were 72 systems – 57 new and 15 refurbished. ASML anticipates that Q3 2004 new unit sales will remain at similar levels to those of Q2 2004. It is expected that new unit sales will accelerate in Q4 2004. "ASML's Q2 2004 financial results reflect the continuing upturn. And we expect that the positive market conditions will stay with us well into 2005," said Doug Dunn, president and CEO, ASML.

<http://www.asml.com>

### Global chip sales show continued increase

Worldwide sales of semiconductors rose to \$17.32 billion in May, a sequential increase of 2.1 percent from the \$16.97 billion reported in April and a 36.9 percent increase from May 2003, reported the Semiconductor Industry Association (SIA). "Worldwide sales of microchips followed historical patterns in May, normally a strong month for the industry," said SIA President George Scalise. "At \$17.32 billion, global semiconductor sales reached their highest level since December of 2000, reflecting continued healthy economic growth, especially in the United States and China. The industry fundamentals continue to look good, leading us to expect strong growth through the remainder of 2004. Customers appear to be managing inventories prudently even in the face of supply-demand constraints."

<http://www.sia-online.org>

#### May 2004 (\$ Billions)

| May 2004 (\$ Billions) |            |               |          |
|------------------------|------------|---------------|----------|
| Month-to-Month Sales   |            |               |          |
| Market                 | Last Month | Current Month | % Change |
| Americas               | 3.19       | 3.20          | 0.2%     |
| Europe                 | 3.22       | 3.18          | -1.2%    |
| Japan                  | 3.66       | 3.73          | 2.0%     |
| Asia Pacific           | 6.90       | 7.21          | 4.5%     |
| TOTAL                  | 16.97      | 17.32         | 2.1%     |
| Year-to-Year Sales     |            |               |          |
| Market                 | Last Year  | Current Month | % Change |
| Americas               | 2.53       | 3.20          | 26.5%    |
| Europe                 | 2.47       | 3.18          | 29.1%    |
| Japan                  | 2.98       | 3.73          | 25.1%    |
| Asia Pacific           | 4.68       | 7.21          | 54.2%    |
| TOTAL                  | 12.65      | 17.32         | 36.9%    |

Source: SIA, July 2004

### Alliances & Mergers

#### Soitec and ASM International report in sSOI development program

Soitec and ASM International N.V. announced a major breakthrough in their joint development effort to combine the compelling speed/performance benefits of strained silicon with the power/performance benefits of silicon-on-insulator (SOI) technology. Key to this effort was successfully introducing a "wafer-level" strain—a capability of avid interest to the IC industry, as it will extend the technology advantages well beyond the highly publicized "local strain" in use today. The resulting new genre of strained SOI (sSOI)

substrates that Soitec will bring to market is design independent and therefore expected to enable an entirely new generation of leading-edge integrated circuits (ICs). Company officials report that the year-long collaborative effort Soitec launched with ASM has resulted in strained SOI substrates that have an extremely high-quality, wafer-level strain without the elevated level of crystal defects that have traditionally plagued this process. The quality of the strained layer reduced the defectivity levels to between 100 and 1000 times lower than the industry standard, bringing the sSOI quality close to that of standard SOI and bulk silicon, calimed the company.

<http://www.soitec.com>  
<http://www.asm.com>



## About Yole

Yole Développement is a market research and strategy consulting company, specialised in :

- MEMS
- Compound semiconductors
- Equipment and materials for the production of semiconductor devices
- Instrumentation for biology markets
- Nanotechnologies

Yole Développement offers different kind of services :

- Custom market research analysis
- Technology analysis
- Business development services
- Specific reports



Jean Christophe Eloy is the founder and Managing Director of Yole Développement, a business development consultant, facilitating market access in the field of MEMS and semiconductor.

Created in 1998, Yole Développement is the world leader in the analysis of the Micro and Nano technologies markets. With more than 15 consultants, Yole Développement is working worldwide with the key industrial companies, R&D institutes and investors in order to help them to understand the markets and technology trends. Yole Développement is taking into account the complete value chain in its analysis, including materials and capital equipment business, device manufacturers and system manufacturers, users of the devices.

## New Projects

### Call for papers for the conference on "Present Situation and Forecasts of Nanotechnology in: Materials, Health and Medical Systems, Energy"

Held in Rome, Italy, November 4th-5th 2004, the conference will present the 1st results of the European Nanoroadmap project. Program, fees, companies exhibitors, registration dates are available on: <http://www.nanoroadmap.it>. For more information, please contact AIRI/Nanotec IT, Email: [info@nanoroadmap.it](mailto:info@nanoroadmap.it)

### Chips to Hits<sup>®</sup>2004, the IBC's 11th Annual International congress

Located in Boston, Massachusetts, on September 20-23, 2004, Chips to Hits is one of the most important conferences related to Microarray and Microtechnology. Over 100 industry leading speakers are expected and 19 sessions dedicated to the applications, the technologies and business strategies have been organized. Full agenda and registration are available on: <http://www.chipstohits.com>

## New Reports

The following reports are available at Yole Développement:

**World MEMS Fab 2004:** Available on a CD-ROM, World MEMS fab ("WMF") contains a description of more than 300 fabs for MEMS worldwide, in Excel<sup>®</sup> format

Publication date: July 2004

Price: 1.300 Euro/1.600 US\$

**Status of the MEMS Industry : back to normal business:** This new report describes the current structure of the MEMS industry, the possible evolutions, the challenges of the actual business models and the detailed analysis of the Top 30 MEMS manufacturers worldwide.

Publication date : June 2004

Price : 1.900 Euro/2.900 US\$

**World Inertial Sensor Markets :** report analysing the MEMS inertial sensor markets and applications, manufacturing organisations and products on the market (paper report, 20 profiles and comparison of available gyros and acceleration sensors)

Publication date : January 2004

Price : 2.900 Euro/3.900 US\$

**SiC World Markets. From materials to devices :** report analysis the SiC markets for the materials, production equipment and devices (paper report, Excel file for market evaluation and 80 profiles, 4.500 Euros)

Publication date : September 2004

Price : 2.900 Euro/3.900 US\$

### New multi-customer action.

We are launching new multi-customer action on the following subjects :

- GaN markets : from materials to devices
- Polymer MEMS
- Micro fuel cells
- World MEMS equipment and materials markets



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