



Consumer applications are driving new packaging for MEMS

Driven by the need to have integrated devices for consumer applications, packaging approaches for 3D integration at the wafer level are now under development. In fact much development work is underway for both 3D stacking and WLP. For example, WLP has been used extensively for accelerometers and gyroscopes, although it is not "true" WLP (as the WL packaged device cannot be mounted itself directly on the PCB). But now, some companies such as Samsung, Hymite and VTI are working on true WLP for MEMS.

Another approach to 3D stacking is one in which MEMS and electronics are stacked together. The mainstream semiconductor industry has large investments in 3D ICs (for Flash, DRAM and also for CMOS image sensors) and MEMS devices will also be deeply impacted by integration at the wafer level.

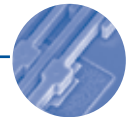
New packaging technologies will exploit micro machining, such as deep etching, and wafer bonding both of which were uncommon outside the MEMS field up to now. One critical factor will be cost. Today, a 3D stacking cost can be as high as many hundreds of Euros. At Yole, we have more and more studies in advanced packaging as our customers are convinced that the impact of this market will be large in the years to come.

Dr. Éric Mounier
Editor-in-chief

EDITORIAL

MEMS

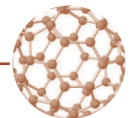
TI is looking to combine mobile phone and projection



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Nanotechnology

Cheaper carbon nano-tubes from Cheap Tubes due to economies of scale



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Optics & Compound Semiconductors

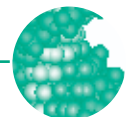
Large-size LED backlight market to triple in 2007



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Microtechnologies for Life Sciences & Chemistry

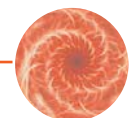
Revolutionary gas-to-liquids technology unveiled



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Photovoltaic

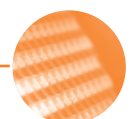
Q-Cells signs long-term supplies agreement with Elkem Solar and acquires equity stake in REC



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IC Manufacturing

What future for the Crolles2 Alliance?



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Hymite closed its series B financing round

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Singular ID receives repeat order and scales-up production
Nanotubes light up solar cells
NovaCentrix scales production of nano-powders

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LG pocket projector driven by Luminus LEDs

Micronews' Platinum Partners



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Setting new standards in MEMS



SURFACE TECHNOLOGY SYSTEMS
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List of companies cited in "Micronews"

MEMS Akustica, Wolfson Microelectronics, Oligon, Virtus Advanced Sensors, MEMSStar, Semefab, MEMS Industry Group, Vistec Semiconductor Systems, Infotonics Technology Center, Northrop Grumman, Hymite, InvenSense, Bosch Sensortec, Texas Instruments, SiTime, Novalux, ViaLogy **NANO** Advance Nanotech, Arrowhead Research Corp, Cabot Microelectronics, Centre of Excellence in Metrology for Micro and Nano Technologies, Cheap Tubes Inc, Clinatex, DuPont Air Products NanoMaterials, French Atomic Energy Commission, General Electric, Institute of Materials Research and Engineering, Minatex, NovaCentrix, Rensselaer Polytechnic Institute, Sanden International, Singular ID, Unidym, University of Surrey **OPTICS & COMPOUND SEMICONDUCTORS** Cambridge Display Technology, Cree, Cyberlux, DOE, Global Communication Semiconductors, Innolume, Lumileds, Luminus, Next Sierra, Philips, Sony, UCSB, Xponent Photonics **MICROTECHNOLOGIES FOR LIFE-SCIENCES & CHEMISTRY** Abbott, Agilent Technologies, bioMérieux, Cambridge Consultants, CardioMEMS Inc., Cepheid, Fluidigm, General Electric Company (GE), Hansen & Company, John Morris, Kyodo International, MDS, Medical Care Consulting AG, Micronit Microfluidics BV, Molecular Devices, National Institute of Standards and Technology (NIST), Nuilab Equipment Company, Oxford Gene Technology (OGT), RainDance Technologies, Stepbio, Syrris Ltd., Teltronic AG, Total S.A., University of British Columbia, University of Chicago, Velocys Inc., VTI Technologies **PHOTOVOLTAIC** Elkem Solar, First Solar, Q-Cells, REC, Spectrolab, Veeco **IC MANUFACTURING** Canon Marketing Japan, Freescale Semiconductor, Intel, LAM Research, NXP, Obducat, Picogiga, SIA, STMicroelectronics, Texas Instruments, TSMC, VLSI Research

The Yole Développement magazine

February 2007 - n° 55

Future Sony televisions feature laser projection

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RainDance's new microfluidic, microdroplet chip
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Picogiga announced pre-production SopSIC substrate
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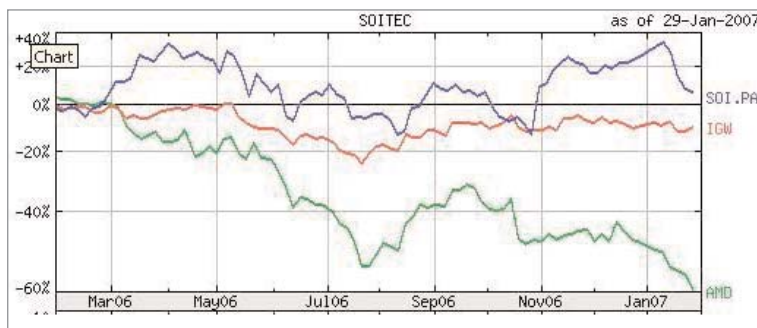
	Symbol		Total number of shares(M)	Price 01-01-06	Price 02-11-06	Variation year to date	High/Low (52-wk range)	Market cap(M) 02-11-06
Material								
Okmetic Oyj (SF)	OKC.F	Eur	16,9	1,95	3,37	72,8%	1,72 - 3,54	56,9
Soitec (F)	SOI.PA	Eur	56,2	14,46	23,50	62,5%	12,81 - 28,90	1320,2
Plan Optik (D)	P40	Eur	3,5	7,37	8,28	12,3%	8,71 - 4,40	29,0
Equipment								
Süss Microtec (D)	SMH.DE	Eur	15,2	4,78	7,85	64,2%	4,32 - 9,37	119,0
STS (UK)	SRTS.L	GBP	31,4	0,17	0,21	23,5%	0,13 - 0,53	6,6
Ultratech (USA)	UTEK	\$	23,7	16,50	13,50	-18,2%	12,75 - 25,03	319,8
Obducat (SE)	OBDUB	SEK	289,5	1,26	1,71	35,7%	1,12 - 4,35	495,1
Lam Research (US)	LRCX	\$	139,9	36,70	48,29	31,6%	34,44 - 53,74	6754,3
Aviza Technology (US)	AVZA	\$	16,1	5,01	4,50	-10,2%	3,46 - 5,26	72,5
PVA Tepla (D)	TPE	Eur	21,7	4,83	4,55	-5,8%	3,30 - 5,39	99,0
Bio related components								
Affymetrix (US)	AFFX	\$	60,3	47,48	24,97	-47,4%	17,50 - 52,44	1505,4
Cepheid (US)	CPHD	\$	41,7	8,86	8,10	-8,6%	6,50 - 11,21	337,5
Caliper LS (US)	CALP	\$	28,6	5,97	5,10	-14,6%	3,95 - 7,49	145,9
Psivida (AU)	PSDV	\$	20,6	5,40	2,15	-60,2%	1,83 - 5,85	44,3
Nanogen (US)	NGEN	\$	54,2	2,61	1,95	-25,3%	1,59 - 3,43	105,6
Acacia Research-CombiMatrix(US)	CBMX	\$	32,6	0,75	0,92	-22,7%	0,70 - 2,90	30,0
Illumina (US)	ILMN	\$	41,2	14,78	42,23	185,7%	13,42 - 45,87	1737,8
Components								
Memscap (F)	MEN.PA	Eur	4,5	24,50*	18,00	-	15,40 - 26,35	81,0
Elmos (D)	ELG.DE	Eur	19,3	9,08	8,15	-10,2%	6,50 - 10,79	157,3
Dalsa Semiconductor (CA)	DSA.TO	\$	16,4	12,79	12,74	-0,4%	11,50 - 16,34	209,3
Analog Devices (USA)	ADI	\$	373,8	36,13	31,59	-12,6%	26,07 - 41,48	11807,6
STM (F)	STM	Eur	901,0	18,30	16,96	-7,3%	14,55 - 19,90	15281,6
Melexis (B)	MELE	Eur	45,6	10,99	13,39	21,8%	9,65 - 14,50	610,6
Cypress SC (US)	CY	\$	135,5	14,60	16,17	10,8%	13,04 - 20,42	2191,6
Freescale SC (US)	FSL	\$	410,8	25,10	39,41	57,0%	24,55 - 39,70	16189,6
Infineon (D)	IFX	Eur	747,6	9,73	11,88	22,1%	8,91 - 12,93	8881,1
Austria Microsystems (Au)	AMS	Eur	11,0	65,91	79,00	19,9%	51,00 - 83,00	869,0
Tessera Technologies Inc (US)	TSRA	\$	44,9	26,60	36,18	36,0%	24,58 - 35,27	1624,5
Cree (US)	CREE	\$	76,3	25,58	20,82	-18,6%	16,52 - 35,30	1588,8

* 21/03/06

Stock of the month:

Shares in Soitec dropped heavily late January after the semiconductor-components maker issued a cautious outlook statement and lowered its guidance for its second-half operating margin, but Soitec is still initiated with "overweight" by JP Morgan.

New Rating (Thu, 18 Jan) Analysts at JP Morgan initiate coverage of Soitec with an "overweight" rating. The 12-month target price is set to E30. In a research note published this morning, the analysts mention that the company is likely to remain a market leader in the fast-growing Silicon-on-Insulator market, with a market share of approximately 90%. Intel is anticipated adoption of Soitec's SOI technology would represent the acceptance of SOI as a de facto industry standard and is likely to be a key catalyst for Soitec's share price, the analysts say. The company is expected to generate an EPS CAGR of 39% through FY12, JP Morgan adds.



Intel is anticipated adoption of Soitec's SOI technology would represent the acceptance of SOI as a de facto industry standard and is likely to be a key catalyst for Soitec's share price, the analysts say. The company is expected to generate an EPS CAGR of 39% through FY12, JP Morgan adds.

Micronews' Gold Partners



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MicroReaction Technologies (MRT): a tool for process intensification

MicroReaction Technology has been developed as a new chemical tool for process intensification. The technology is still at its early stage but has already started to succeed with implementation in R&D labs of fine & specialty chemicals companies. This technology has many advantages to drive innovation e.g. in leading to new and high quality products. Fine and speciality chemicals represent a niche market for this technology that could reach about € 140 M in microstructured parts in as few as 15 to 20 years for production purposes. Improvement of the technology leading to increased technical and economical benefits will open the way to larger markets like commodity chemicals and energy applications.

Introduction to microreaction:

MicroReaction Technologies (MRT) can be defined as the design, fabrication and use of miniaturized fluidic components produced by using microtechnology techniques and precision engineering, leading to channel diameters smaller than 1 mm.

Under the generic world "MicroReaction Technologies", different products or microstructured units are grouped, namely microreactors, micro-mixers and micro heat exchangers :

- Micromixers allow high mixing quality and efficiency, under laminar conditions.
- Micro heat exchangers are more energy efficient than larger scale exchangers, due to the increased exchange surface they provide
- Other microstructured units are being developed, especially for work up procedures, in order to have separation units that are compatible with micro-sized production units, when necessary.

Different microreaction technology based solutions are available. From their first use, microreactors have been developed for research labs and sold as individual units to be assembled by the users. Attracted by the potential of the technology, the first users enjoyed the freedom such solution provided in process design and chemical reaction engineering.

MRT suppliers expanded their offerings to tabletop systems, integrating pumps, reagent feedstocks, as

well as computer and software to drive the equipment. This evolution through a more global offering has facilitated widespread access to the technology. Such equipment however is still mainly used for R&D purposes (see figure 1).

Today a few production plants are integrating microstructured units. They are mainly used for manufacturing intermediates in the fine chemicals business. DSM Fine Chemicals GmbH in Linz, Austria, has produced 300 tons of a high value polymer product within 10 weeks, with a 65 cm long microstructured reactor, 290 kg, 1700 kg/h liquid throughput. Clariant (CH) announced in 2005 an annual production in microstructures of 1000 tons of pigments.

Involvement in microreaction

Most MRT suppliers are European companies as shown figure 2.

Born at the end of the 80's in Germany, this technology has still many developments there, where the majority of the technology suppliers are located and national projects are funded by the BMBF. Several national or international projects are financed worldwide,, to encourage cooperation between academic partners and industrials to foster effective use of MRT in chemical and pharmaceutical production processes (Impulse in Europe, Department of Energy in the US, MCPT NEDO project in



Figure 1: from MRT modules to plants, through systems

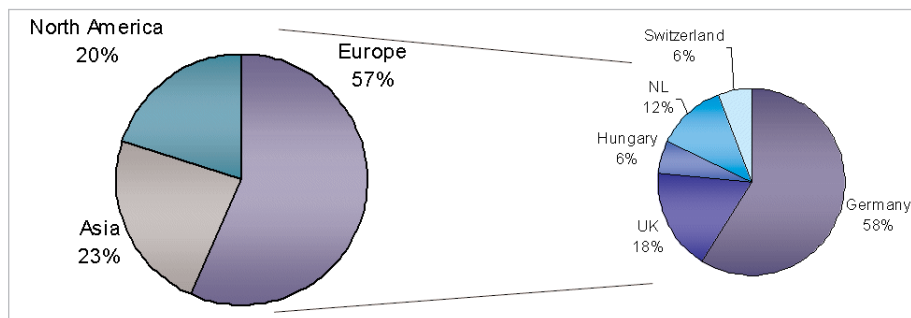


Figure 2: MRT suppliers geographical breakdown (30 companies considered)

Microreaction Market Potential and Evolution

Microreaction still represents today a low volume market, estimated by Yole Développement at €10 M in 2005 for MRT modules and systems. The fine & specialty chemicals business represents the largest part of the MRT market which is today in

Japan ...). A large amount of field support is provided by the research institutes, especially IMM, in Germany. Other research centres are supporting the development of the technology, among those are: Forschungszentrum Karlsruhe (FzK), Fraunhofer ICT and Technical University of Chemnitz (TUC) in Germany, Massachusetts Institute of Technology (MIT), Stevens Institute and Pacific Northwest National Laboratory (PNNL) in the US, Tokyo and Kyoto Universities, MCPT initiative in Japan and other centres in Europe: University of Hull (UK), Ecole Polytechnique Fédérale de Lausanne EPFL (Switzerland) or CNRS INPL, CPE, and CEA in France.

Benefits of microreaction technologies in the chemical field

This development of microreaction technologies can be explained by their various advantages:

- MRT ensures processes that cannot be carried out in standard reaction (better control of chemical process leading to higher quality and purity of products)
- MRT increases chemical processes safety and environmental friendliness
- MRT reduces development times
- MRT decreases operating costs.

In a future scenario, MRT could also be used for delocalised production to avoiding product transportation, however this does not represent MRT's main advantage today. They are rather related to new product development.

The technology is used today mainly at the R&D stage in chemical companies. Transfer to production is expected, but MRT is facing slow industrial implementation. Most chemical companies still perceive high risks in the implementation of such technology in their production plant. The use of this technology from a production perspective in the chemical industry will lead to a change of paradigm from batch operations to a continuous flow.

Some technical improvements are also required to increase the range of chemical synthesis possible in using MRT solutions. Numerous projects worldwide are running to test and validate the attractiveness of MRT and their results could favour wider implementation of the technology.

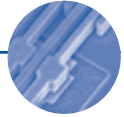
its infancy. This niche market is expected to reach €140 M in 15 to 20 years with transfer to production. The challenge for MRT solutions providers is to broaden the use of the technology. This will become possible by overcoming the remaining technical and economic hurdles to MRT implementation. For example an adaptation to polyphasic reactions, especially solid handling to avoid fouling and clogging will make it possible to enlarge the number of chemical processes and syntheses possible with MRT. Compatibility of the technology with high volume production has also to be demonstrated. Such developments could lead to a larger use of MRT in the chemical field especially in commodity chemicals but this is rather a long term application for the technology. Energy applications, especially refining and off shore platforms could benefit from the added value of MRT technology.

Conclusion

Microreaction technology is at its early stage. This technology is today rather used in the fine and specialty chemicals niche market, and in particular for lab use.

The main challenge of MRT is now to optimise the number of reactions possible especially in solid phases. MRT is above all a change of paradigm in the chemical process since switching from batch to continuous flow implies a complete redesign of the production process. This change will only be possible by increasing knowledge in MRT and the range of solutions available, which rests on the academic and industrial education of chemical engineers. This trend has already started; education efforts are visible today, as well as changes in mentalities, proven by the evolution of the MRT market and the beginning of production implementation. MRT chemical production sites are now running in Europe such as DSM Linz (Austria) as well as in China in Xi'an Huian Chemicals.

MRT has a real economic potential. However, large implementation of microreaction technology will take time due to the high investments required, slow implementation in production plants in the chemical industry and the long lifetime and depreciation of existing chemical plants.



Novalux unveils laser-based pocket projector

Novalux has shown groundbreaking prototype miniature projectors during the 2007 International Consumer Electronics Show (CES), including a laser-based pocket projector that outshines a competitive LED unit, and a 2D MEMS scanning device. This miniscule device is the forefather to the "embedded" projectors slated for integration into cell phones, PDAs and camcorders.

<http://www.novalux.com>

Free Market Briefing

Optical MEMS and LEDs/LDs light modules, A new business opportunity for the MEMS companies At Smart Systems Integration Conferences



28 March, 2007, 17:00 – 19:00

PARIS, FRANCE

Take time to attend Yole Développement's Market Briefing

Yole Développement, the Market Research and Strategy Consulting Company specialising in Micro & Nanotechnologies, gives you their detailed analysis on [Optical MEMS and LEDs/LDs light modules](#).

As an ancillary event to [Smart Systems Integration](#), the Market Briefing is organised by **Yole Développement** and its [Optical MEMS](#) experts. Our aim is to give you an overview of our Micro & Nanotechnologies analysis.

After the fibre optics telecom downturn in 2000, [MOEMS](#) developments have been slowing down. Today, [MOEMS](#) is still a major part of the global MEMS market, mainly thanks to the DLP device from Texas Instruments. Moreover, there are numerous [MOEMS](#) developments for new display applications such as HUDs, HMDs, pico-projectors ... Many MEMS players are now targeting the portable display application with micro-mirrors.

Another trend is the use of solid state lighting where MEMS are already used. Using both micro-mirror and LEDs brings further system integration for portable applications: "There is a synergy between [MOEMS](#) and LEDs/LDs for consumer applications as both technologies bring increased integration with better performances", explains Dr Mounier.

Yole Développement will give you a general overview of the MEMS markets and a focus on [MOEMS](#) markets. Examples of [MOEMS](#)-based systems where [LEDs/HBLEDs](#) or [LDs](#) are used will be presented (DLP-RPTVs, HUDs, compact projectors ...).

Yole Développement estimates that the [MOEMS](#) market will grow from \$ 1.3 B in 2005 to > \$ 3.2 B in 2010 with projection/display being more than 50% of the total [MOEMS](#) market.

Market Briefing – Key technological challenges

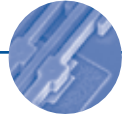
- Optical MEMS / Light source integration
- Power Management
- Light management for the source until the visualisation systems
- Price target

The first [Smart Systems Integration](#), European Conference & Exhibition on integration issues of miniaturized systems is to take place in Paris between 27 and 28 March 2007. This event is dedicated to MEMS, [MOEMS](#), ICs and electronic components.

Out of 138 submissions, SSI's committee has selected 44 papers for presentation from sciences and industry, at the conference. Keynotes, tutorials, special sessions and poster presentations round off the program.

Market Briefing contact: Yole Développement, Sandrine Leroy, leroy@yole.fr
Smart Systems Integration (Mesago Messe Frankfurt): www.smartsystemsintegration.com/
Phone: +49 711 61946-86 / Email: smart@mesago.de





Techno News

TI is looking to combine mobile phone and projection

Texas Instruments Inc. is applying its moving micromirror technology, which it calls digital light processing (DLP), to mobile phones. No surprise there. If anything such a move is overdue.

Indeed, a statement from Texas Instruments to announce a demonstration at the Consumer Electronics Show in Las Vegas was somewhat underwhelming; it suggested connecting a mobile phone to one of several makes of small DLP projector "available at major retailers today. John Van Scoter, senior vice president at Texas Instruments and general manager DLP Products said that TI is combining two of its core technologies, DLP and

OMAP, to improve the mobile viewing experience. By simply connecting one of these devices to a tiny DLP pocket projector, 30 to 50-inch projected images are possible." Unfortunately, from this statement, it remains unclear how long TI thinks it will take to develop a projector small enough to be designed in to a mobile phone, or whether it is even trying to do it. Given TI's pioneering positions in both projection display and mobile phone markets it would be expected that the company should be a pioneer in combining the two technologies.

<http://www.ti.com>

Bosch Sensortec unveils its fifth 3-axis accelerometer

With the new SMB380 acceleration sensor, Bosch Sensortec is adding an extremely small digital sensor with a customized setting function to its product line of triaxial sensors. The SMB380, which is also specifically developed for consumer electronics, is Bosch Sensortec's fifth sensor within 18 months. The SMB380 is especially suitable for human machine interfaces (HMI), free-fall detection, as well as mobile and ultra-low-power applications. The sensor is available as an engi-

neering sample from January 2007. Bosch Sensortec plans to start volume production in June 2007. In comparison with the current generation, its size is reduced by 50 percent. Measuring only 3 mm x 3 mm x 0.9 mm, the SMB380 fits into even the smallest mobile devices.

<http://www.bosch-sensortec.com>

Market Focus

NEW REPORT

Do you really know the 500 MEMS players worldwide?

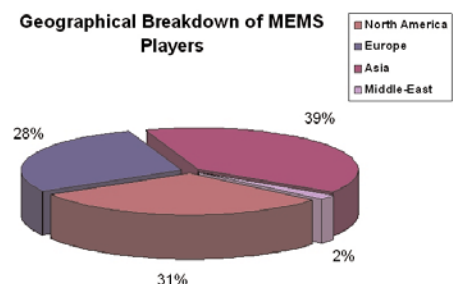
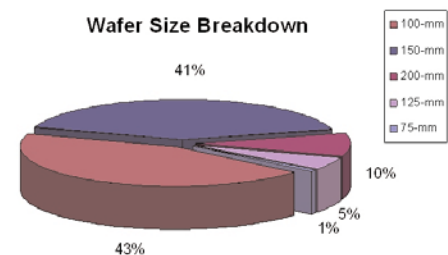
World MEMS Fab 2007 is an Excel data base describing almost 500 players including all business models worldwide (R&D, fab, fabless, foundry, integrated fab ...). WMF database features technology details (clean room & wafer size, capacity, processes, type of products ...) as well as sales, staff and contact details of top executives (address, phone, email ...).

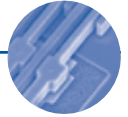
This database is an invaluable tool for Marketing, Sales or Business Development Manager to find new prospects as well as discovering used technology, type of business, process ... "World MEMS fab" will enable you to edit detailed company profile for your sales force and allow them to contact Fab or Technical Manager in the best conditions.

This database will also help VC & financing organizations to learn the reality of the MEMS industry and also discover MEMS organisations in emerging countries like China and India or to get a clearer picture of Asian players in Korea, Japan or Singapore.

World MEMS Fab is a unique tool for Executives interested in the MEMS industry to get a complete overview of worldwide facilities.

If you want to learn everything on World MEMS players, Yole Développement has just released a data base World MEMS Fab 2007, the Exhaustive Database of MEMS players. For more information on this data base please go to www.yole.fr or ask David Jourdan, jourdan@yole.fr, +33 472 830 190.





Techno News

ViaLogy announces performance improvement for MEMS gyros

ViaLogy plc has announced that a major improvement in the performance of a vital piece of equipment used in the aerospace and military industries has been achieved in a collaboration between ViaLogy, Boeing and NASA's Jet Propulsion Laboratory (JPL) in Pasadena, CA. Scientists at ViaLogy, an innovator of real-time network-centric signal processing platforms for sensor applications in defense, aerospace, homeland security and the life sciences, have achieved a 10X improvement in the stability and performance of the miniature vibratory gyroscope. ViaLogy CEO

Michael Kelly explains: "We have developed proprietary signal processing software to short-circuit complex device engineering and deliver MEMS sensors which are on a par with the performance of much bulkier and entrenched versions. Costs are also greatly reduced." The development work has been tested on the JPL/Boeing miniature vibratory gyroscope. The successful development of the gyro enhancement software opens up an important new market for ViaLogy.

<http://www.vialogy.com>

Business News

SEMEFAB selects memsstar for advanced release etching solution

As a key part of its new 150mm MEMS foundry, Semefab has selected memsstar® systems as the preferred solution for advanced release etching. After extensive evaluation Semefab has purchased the latest memsstar® SVR system for dry release etch of advanced structures, and will offer its customers a unique capability for the fabrication of devices including membranes, cantilevers,

channels and microbridges. With its unique Controlled Continuous Flow Technology – CCFT – memsstar® will enable SEMEFAB to develop and manufacture dry process flows on a wafer scale while achieving cost effective yields with leading manufacturing and process controls.

<http://www.memsstar.com>

<http://www.semefab.co.uk>





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■ Medical Technologies	■ Biotechnology and Chemistry
■ Logistics/RFID	■ Communication technologies
■ Life Sciences	■ and others
■ and others	

European Conference & Exhibition on integration issues of miniaturized systems – MEMS, MOEMS, ICs and electronic components

Organizer:

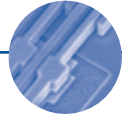


Co-Organizer:



Part of the activities of:





Business News

MEMS prolific in consumer electronics says MEMS Industry Group

The MEMS Industry Group (MIG), the trade association representing the microelectromechanical systems (MEMS) and microstructures industries, released its annual industry report. The MIG Industry Report -- Focus on MEMS Integration predicts that 2006 will be marked as the year in which MEMS made significant inroads into the consumer electronics market, in applications such as accelerometer-based motion sensing in remote consoles for gaming; integrated dual-axis gyroscopes for image stabilization in mobile phones and digital still cameras; silicon microphones into acoustic modules; and silicon resonators enabling

multiple timing applications, such as quartz replacement in watches. Once measured in the hundreds, MEMS devices are being measured in the hundreds of thousands and are being sold by the millions. The MEMS market is expected to double from \$5 Billion to nearly \$10 Billion in the next six years, according to Yole Développement. Driving this success, according to the MIG report, are improved manufacturability and technological advances that enable more functionality on a single chip.

<http://www.memsiindustrygroup.org>

Vistec receives orders from European MEMS manufacturer

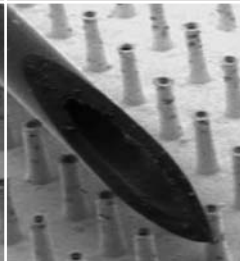
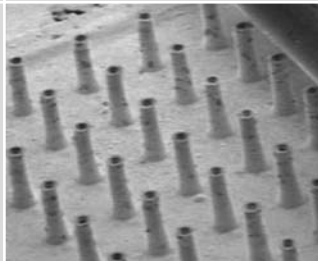
Vistec Semiconductor Systems GmbH (previously Leica Microsystems Semiconductor GmbH) is delivering two infrared inspection systems INM100 IR to a European MEMS manufacturer. The customer will use one system each for production and defect analysis. Infrared microscopes offer the opportunity to see through Silicon layers. The high transparency of silicon in infrared light permits the detection of defects, which are not visible by any

other illumination method.

The MEMS manufacturer made its decision to order two INM100 IR systems following an on-site evaluation of Vistec microscopes. Vistec said that the customer was convinced by the combined VIS and IR illumination, which can be used for surface and see-through inspection, as well as the excellent infrared optics.

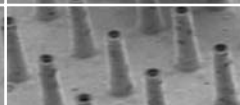
<http://www.vistec-semi.com>

SU-8 Resist Removal for Production of MEMS

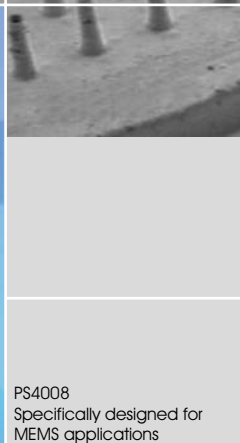


- Dry Microwave plasma process
- Fast, uniform removal
- Residue free processing

400µ tall microneedle array generated using SU-8 process technology
Courtesy: University of Texas at Dallas



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www.pvateplaamerica.com



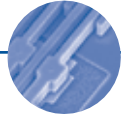
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Business News

Hymite closes series B financing round

Danish-German technology company Hymite A/S, an innovative supplier of advanced wafer level packaging products for electronics, micromechanical and optoelectronics components, announced closure of its Series Preferred B financing round totaling EUR 9.0 million (DKK 70 million) by a European consortium of VCs consisting of TVM Capital (Germany), InnovationsKapital (Sweden), Dansk Kapitalanlaeg, Vaekstfonden, and IVS (all Denmark). Hymite's innovative wafer level packaging products are advanced low-cost solutions that enable new and better ways to package ultra-

compact, high-brightness Light Emitting Diodes (LEDs), MEMS components and RF devices for mobile phones such as filters or RF integrated circuits. With its current product portfolio Hymite is addressing high-growth volume markets including handheld devices, consumer electronics, and automotive products.

With the new investment Hymite is strengthening its sales organization, increasing its customer base and building up its manufacturing infrastructure using external foundries.

<http://www.hymite.com>

Invensense secures \$11 million in a new round of funding

InvenSense, provider of integrated motion sensing solutions for mobile and consumer applications, announced it has secured \$11 million in Series B funding. The infusion will finance the company's high-volume production ramp for its popular integrated dual-axis gyroscope and will fund the completion of new product development for the handset market. QUALCOMM Ventures participated in the round, along with existing investors Artiman Ventures and Partech International, who fully participated in the round. The new round of funding is

the next step in the company's strategy to pursue new market opportunities for integrated motion sensing in consumer electronics, including gaming and mobile handsets. Using its initial round of funding, InvenSense was able to complete development, testing and production of hundreds of thousands of units for its flagship IDG product family of dual-axis gyroscope, and to secure multiple design wins with major consumer electronics OEMs, including Sanyo Electronics.

<http://www.invensense.com>

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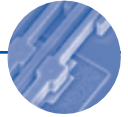
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Business News

Infotonics receives \$5 million for new labs

Infotonics Technology Center has received \$5 million in state funding for the construction of a "microsystems packaging lab" at its Campus Drive site. The money is part of a \$10 million pledge announced by then-Gov. George Pataki in November 2005. The newest batch of financing will go towards a lab specializing in the development of "packaging technology." In other words, it

will be where the tiny light-retracting mirrors that make advancements in photonics possible are encased in cutting-edge, contaminant-proof "packages." That makes them usable in electronics, diagnostic tools, even prosthetics. Construction on the lab will begin in February and should be completed by June 1.

<http://www.infotonics.org>

Northrop Grumman receives \$256 million to upgrade inertial systems

Defense contractor Northrop Grumman Corp. announced in January that it has won a \$256 million contract from the Air Force to upgrade a multi-sensor military aircraft to track cruise missiles. The Los Angeles-based company will design an airborne system that will provide a combination of cruise missile defense and ground moving target tracking.

<http://www.northropgrumman.com>

Alliances & Mergers

Wolfson Microelectronics acquires start up company Oligon

Wolfson Microelectronics last week acquired a Scottish company and design team with micro electromechanical system (MEMS) technology. Wolfson is paying \$5.7 million (2.9 million pounds) for Oligon, a MEMS sensor startup located at the Scottish Microelectronics Centre (SMC) in Edinburgh. Oligon, which employs just six people, integrates microphones into semiconductors. Its co-founder, Richard Laming, also co-founded

optoelectronics company Kymata. The attraction for Wolfson is likely to be a proprietary process that allows the fabrication of MEMS transducers using CMOS techniques. Under the deal, Wolfson pays £1.4m upfront, and up to £1.5m more on the achievement of undisclosed milestones.

<http://www.wolfsonmicro.com>

<http://www.oligon.com>

Virtus announces collaboration agreement with Unimicron and ChipSense

Virtus Advanced Sensors has entered into a strategic collaboration agreement with several Taiwan-based UMC Group companies including Unimicron, Taiwan's largest printed circuit board (PCB) manufacturer and affiliated MEMS foundry ChipSense. UMC is the world's second largest semiconductor foundry and parent company of Unimicron. The companies will collaborate on producing 3-axis accelerometers for a variety of

consumer electronics oriented market applications including cell phones, laptop computers and car navigation systems. The agreement includes collaboration on product design, production, marketing and sales activities. With this collaboration, Virtus has a reliable and capable manufacturing partner, ChipSense, and this is also a further validation of Virtus' technology.

<http://www.virtusensors.com>

Plan Optik acquires 100% of Little Things Factory

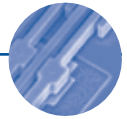
Plan Optik has announced its acquisition of 100% of Little Things Factory (ltf) shares at the end of 2006. Little Things Factory develops, manufactures and commercializes High Throughput Microfluidics systems (HT-Microfluidics) for the chemical industry. Founded in 2000 as a spin-off from Ilmenau University, Little Things Factory is working with customers like Degussa, BASF, Merck, Schering and Siemens. The Little Things Factory company provides HT-Microfluidics sys-

tems structured by sand blasting on wafers from Plan Optik. With the systems of Little Things Factory, the chemical industry can accomplish processes available to date only in large-scale installations. Such small systems are economical, precise and well controlled. Little Things Factory will immediately contribute to 2007 revenues and profitability of Plan Optik.

<http://www.planoptik.com>

<http://www.ltf-gmbh.de>

You can send us press releases to mouly@yole.fr



Life & Death

Akustica's microphone family awarded as 'product of the year'

Akustica, Inc., an innovator in microelectromechanical systems (MEMS), announced it was honored with an Electronic Products' Product of the Year award for its family of Complementary Metal Oxide Semiconductor (CMOS) MEMS digital microphones. The Akustica AKU2000, AKU2001 and AKU2004 devices were lauded as the first and only family of complete microphones—from voice input to digital output—on single surface-mountable monolithic chips.

<http://www.akustica.com>

SiTime MEMS oscillator named product of the year

SiTime, a privately held Silicon Valley startup company bringing MEMS-based, all silicon timing solutions to market, announced it was honored with an Electronic Products' Product of the Year award for its SiT8002 programmable oscillator.

<http://www.sitime.com>

R & D

MEMS Research at Tohoku University

By Kentaro Totsu, Ph.D., Research Associate

Department of Nanomechanics, Tohoku University

Phone +81-(0)22-795-6937 totsu@mems.mech.tohoku.ac.jp



Kentaro Totsu

Introduction of Tohoku University

Tohoku University was founded in 1907, as the third National University in the city of Sendai. Well known for its open and progressive policies, it was the first imperial university to admit women and foreign students through its gates and as a pioneer open university, it offers its facilities to the community for public lectures.

Today, the University is composed of 10 undergraduate schools, 17 graduate schools, 5 research institutes and many other educational and research centers and facilities which cover a wide range of fields from the humanities to social, natural and medical sciences. There are nearly 5,000 faculty and staff members and 18,000 students on five campuses; of the student body about 4,100 are women and 1,100 international students come from over 70 different countries around the world.

Based on our history and tradition, we have established three fundamental policies; the University's mission to become a "Research-Intensive University" founded on the principle of, "An Open University to the World and Community" and a goal of, "The Development of Future Leaders". The staff and faculty members are also promoting further reforms along these ideas.

Tohoku University is proud to celebrate its 100th Foundation Anniversary Day this year in June 2007 with a series of congratulatory events for this auspicious occasion.

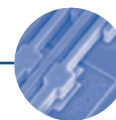
MEMS Activity

Tohoku University has been carrying out MEMS research for over 30 years. Presently, more than 30 faculty members, 300 researchers and students are working on MEMS-related research. Our research

interests include MEMS process technology, MEMS sensors, Optical MEMS, RF MEMS, Power MEMS, Medical MEMS, Bio MEMS, Chemical MEMS and NEMS. Tohoku University is recognized as one of the most active MEMS R&D institutes in the world. Prof. M. Esashi, the MEMS research head at Tohoku University, operates on the policy of "Open Collaboration", where our knowledge and facilities are shared to develop valuable technology for society. This policy is imbued in the staff and students at Tohoku University as well as researchers from companies who have collaborated at our laboratory. More than 100 researchers from Japanese and foreign companies have been accepted into MEMS research groups at Tohoku University throughout the last decade. We have successfully commercialized over 20 products as a result of this Open Collaboration policy.

Two clean room facilities are utilized for MEMS research at Tohoku University with over 300 registered members, and we are proud of this flexible system. The "Kyodo-to Clean Room" is a 120 m² facility with many in house developed machines. The machines are operated by our members and can be easily modified to utilize and develop new processing techniques. The "Micro-Nano Center Clean Room" is our second facility with 600 m² in area and is shared with our CMOS research group. These clean room facilities are equipped to handle 20 mm x 20 mm, 2 inch and 4 inch wafers. Our clean room facilities, in addition to our evaluation tools such as our SEM are open for use by companies, other universities and institutes.

To accelerate MEMS industrialization, the MEMS



R & D

Park Consortium was founded in 2004, supported by Tohoku University, the City of Sendai, the Miyagi Prefectural Government, the Tohoku Bureau of Economy, Trade and Industry, the Development Bank of Japan, Tohoku Branch, the Tohoku Economic Federation and SEMI Japan to develop a MEMS research and industrial hub in Sendai. 110 companies have joined this consortium to create highly competitive MEMS solutions achieved through information sharing in an open environment. Currently, the consortium provides MEMS related seminars, practical training programs, R&D coordination and commercialization services.

Research on microreactor

Prof. S. Tanaka is conducting the research on Power MEMS and chemical processors at Tohoku University.

Micro fuel reformer

A Micro fuel reformer is a promising solution to supply hydrogen to a portable fuel cell. A micro fuel reformer, which integrates a combustor, an evaporator, a reforming chamber and a temperature sensor in a size of 20 x 25 x 6 mm, has been developed (Yoshida et al., JMM 2006). Two fuel reforming reactors are placed on either side of the combustor to make the system compact and use combustion heat efficiently. In addition, to achieve high power density, the reforming reactor uses a microchamber filled with high performance powdered catalyst. Fuel reforming tests were performed by using a mixture of methanol and water as reforming fuel and hydrogen as combustion fuel. The conversion rate of the fuel was almost 100 %. And 6 W LHV (low heat value) of hydrogen was produced. This corresponds to the world highest level of power density, which was realized by integrated micro fuel reformers.

A micro fuel reformer with a suspended membrane structure achieves high efficiency due to its excellent thermal isolation. The suspended membrane is composed of a low-stressed SiO₂ membrane and a silicon center plate, on which micro-heaters are formed. To form an active catalyst selectively on the suspended membrane, an in situ chemical vapor deposition (CVD) method, by which alumina catalyst bed is deposited from a metal organic precursor on the membrane locally heated by the micro-heaters, has been developed (Takahashi et al., JMM 2006). Self-sustaining hydrogen combustion was demonstrated on the deposited alumina catalyst bed with platinum. The temperature difference between the suspended membrane and the bulk substrate reached 570 K. The maximum space velocity (SV) value allowable for the formed catalyst was approximately 680,000 h⁻¹.

Catalytic combustor for thermoelectric generator

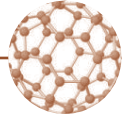
A catalytic butane combustor for a thermoelectric (TE) generator has been developed (Yoshida et al., JMEMS 2006). A set of 34 couples of BiTe TE elements, each with a size of 0.65 mm x 0.65 mm x 2 mm, are directly bonded to both sides of the silicon combustor, whose size is 8 mm x 8 mm x 0.4 mm. The combustor without the TE modules was tested using butane as fuel, and self-sustaining combustion and electrical ignition were successfully demonstrated. Nearly 100% combustion efficiency and a uniform temperature distribution were also realized. The total efficiency in TE generation was 2.8% with the obtained power of 184 mW, with a load of 5.9 Ω. If the same total efficiency is achieved using butane as fuel, the energy density becomes 440 Wh/kg and 270 Wh/l, which is about 4.4 and 1.4 times higher than that of existing lithium-ion batteries, respectively.

Thin palladium membrane microreactor

The application of dissociated hydrogen promoted by the palladium (Pd) membranes to chemical reactions enables us to simplify the multi-step process of chemical product synthesis. A MEMS-based thin Pd membrane microreactor with oxidized porous silicon (PS) support has been developed (Ye et al., JMM 2005). The hydrogen flux through the Pd membrane with a thickness of 340 nm was 0.112 mol m⁻² s⁻¹ at 250 °C and a partial pressure difference of 212 kPa. H₂/N₂ and H₂/He selectivity was about 44 and 10 at 250 °C, respectively. The thermal isolation of the Pd membrane, which was heated by an integrated microheater, was realized by using the oxidized PS ring. The hydrogenation of 1-butene at 250 °C using the developed microreactor has been carried out. The conversion of 1-butene of 100% was obtained at low flow rate of 1-butene, and the selectivity of the reaction was higher than that achieved by a macro-size palladium tube reactor. The results show that microreactors have a potential to be used in hydrogen purification and hydrogenation.



Kyodo-to Clean Room at Tohoku University



Business News

Cheaper carbon nanotubes from Cheap Tubes due to economies of scale

Cheap Tubes Inc is pleased to announce their 2007 Carbon Nanotube Pricelist which has significant savings for their customers. Due to economies of scale (greater than 1000% sales growth in 2006), increased CNT production by their exclusive supplier, as well as increased synergies in supply line, Cheap Tubes Inc has been able to significantly reduce their prices on the same high quality CNTs that they have been selling for the past

two years. They have recently reduced the prices on MWNTs in KG and ton quantities as well as OH and COOH functionalized MWNTs. Customers can now purchase 4 sizes of 95wt% pure MWNTs in KG quantities for under \$1000. When purchasing ton quantities (\$250,000) the price drops to \$250 per KG. SWNTs 90wt% are priced at \$150 per gram or \$75,000 per KG.

www.cheaptubesinc.com

Cabot Microelectronics files patent infringement action against DuPont Air Products NanoMaterials

Cabot Microelectronics has announced that it filed a legal action against DuPont Air Products NanoMaterials LLC (DA Nano) for DA Nano's manufacture and marketing of certain CMP slurries that infringe patents owned by Cabot Microelectronics. The affected DA Nano products include those used for tungsten CMP.

www.cabotcmp.com

Singular ID receives repeat order and scales-up production

Advance Nanotech has announced that Singular ID, a company in which Advance Nanotech holds a 11.45% stake has received a repeat order from Sanden International (Singapore) Pte Ltd (SIS). Singular ID is the provider of enxure, an individually tailored tagging solution designed to combat counterfeiting and forgeries offers unique, irreproducible tags with nanoscale magnetic domains that act like fingerprints to identify each

tagged item. The Singular ID investment falls within the Homeland Security division of Advance Nanotech. The new order is to provide labels for SIS's entire compressor production for the next twelve months. Singular ID is now scaling-up its production to meet this substantially increased demand.

www.singular-id.com

Techno News

Nanoceramics to order

Researchers at General Electric (GE) have discovered a new way to make nanoceramic materials directly from polymeric precursors. The result could open the way to developing high-temperature, durable nanoceramics for applications in energy, aviation and catalysts.

www.ge.com/research/

New hybrid structures make strong nanowires

Researchers at Rensselaer Polytechnic Institute, in the US, have created hybrid structures that combine the best properties of carbon nanotubes and metallic nanowires. The new structures could overcome some of key problems in employing carbon nanotubes in a wide variety of applications including computer chips, displays and sensors.

<http://news.rpi.edu/>

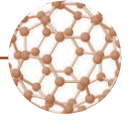
Nanotubes light up solar cells

Researchers in the UK have made a new type of hybrid electrode from multi-walled carbon nanotubes and indium-tin oxide that could be used for solar cell applications. The nanotubes are directly grown on indium-tin oxide coated glass, a transparent electrode commonly employed in organic

optoelectronic devices, such as solar cells and light-emitting diodes. The nanotube electrodes are highly transparent at longer wavelengths, making them ideal for harnessing light from the Sun.

<http://www.ee.surrey.ac.uk/NEC/>

You can send us press releases to pieters@yole.fr



Alliances & Mergers

Unidym and the Institute of Materials Research and Engineering to collaborate

Arrowhead Research Corp. of Pasadena, CA, announced that its majority-owned subsidiary, Unidym, has entered into a collaborative agreement with the Institute of Materials Research and Engineering (IMRE) in Singapore.

The collaboration will develop organic light emitting diodes (OLEDs) that incorporate transparent electrodes made of carbon nanotubes.

Unidym will provide IMRE researchers with access

to its proprietary, carbon nanotube-based, transparent electrodes, which IMRE will incorporate into its OLED devices. Arrowhead says carbon nanotube-based transparent electrodes could improve the performance of OLEDs while reducing their production costs.

www.unidym.com

www.imre.a-star.edu.sg

Life & Death

Micro and Nano Metrology Centre of Excellence offers unique solutions for industry

The Centre of Excellence in Metrology for Micro and Nano Technologies (CEMMNT) is now open and offering a unique measurement and characterisation service for industry.

A network of partners is providing open access to state of the art equipment for materials characterisation at the micro and nanoscale, with inter-disciplinary problem-solving expertise.

Both routine measurements and large scale bespoke development and diagnostic projects can be

undertaken. In addition to creating CEMMNT Hub Ltd, funding from the DTI has enabled the partnership to add new laboratories, clean room facilities, and cutting edge instrumentation.

The CEMMNT network will promote awareness and knowledge transfer of micro and nano metrology throughout industry, by running training courses, workshops, and networking events.

www.cemmnt.co.uk

NovaCentrix scales production of nanopowders

Texas-based NovaCentrix has announced advancements which allow high volume production of nanopowders. NovaCentrix completed these efforts to meet current and future commercial application demands, including the shipment of what is reported to be the world's largest order of aluminum nanoparticles in the second half of 2006. A manufacturer of nanoscale metals including silver, copper and aluminum, NovaCentrix' large-scale commercial production equipment is now capable of

producing metric tons materials annually. NovaCentrix utilizes its proprietary pulsed-plasma synthesis process to offer high performance metal nanoparticles ranging from 1 nm to 120 nm. The company also produces a select range of nanoscale oxides, such as iron oxide and niobium pentoxide. NovaCentrix is developing Metalon™ inks, a full portfolio of nanoscale conductive inks for printable electronics applications. The company has made available Metalon™ JS-011, a water-

based, electrically conductive silver ink especially formulated for ink jet printers, and Metalon™ FS-066, a stretchable, conductive ink formulated to adhere to flexible substrates, and stretchable up to 100 percent while maintaining conductivity performance. For the life science applications, NovaCentrix' Effisil™ silver additives are used in FDA approved wound care products.

www.nanoscale.com

France to open nano-based neurosurgery clinic

Clinatec, an experimental clinic specialising in nanotechnologies-based treatment, will be established within the next three years in Grenoble, France. The clinic is the initiative of Professor Alim-Louis Benabib, a neurosurgeon. Under his guidance, the clinic will make use of the latest medical nanotechnologies to conduct brain surgery on patients suffering from degenerative diseases like Parkinson's. "The idea is to build an

experimental centre which will treat on average one patient per month and whose activity will be followed by an ethics committee," said Jean Therme, Director of the French Atomic Energy Commission (CEA). The clinic will benefit from the work being carried out at Minatec, Europe's largest research centre in micro-nanotechnologies, which is also located in Grenoble.

www.cea.fr

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- *Passive Circuit Elements*
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- *Non-Planar Passive Filters and Multiplexers*
- *Active and Integrated Filters*
- *Ferroelectric, Ferrite and Acoustic Wave Components*
- *MEMS Components and Technologies*
- *Semiconductor Devices and Monolithic IC Technologies*
- *Signal Generation*
- *Frequency Conversion and Control*
- *HF/VHF/UHF Technologies and Applications*
- *Power Amplifier Devices and Integrated Circuits*
- *High Power Amplifiers*
- *Low Noise Components and Receivers*
- *Millimeterwave and Terahertz Components and Technologies*
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Business News

Large-size LED backlight market to triple in 2007

Representing only a tiny niche in the wider market for LCD backlights, sales of LED-based units will nevertheless grow at a rapid pace between now and 2009, says a new report from DisplaySearch. In what it describes as a "conservative" outlook, market analyst DisplaySearch says that unit shipments of LED backlights for LCD televisions and PC monitors will reach nearly 3 million in 2007. LED-based backlights for large-size LCDs

are viewed as one of the key next-generation applications to drive sales of high-brightness emitters. However, the market has been very slow to take off so far, and only 1 million LED backlight units for screens greater than 10 inches in size shipped in 2006, according to DisplaySearch's latest report. Since the backlight unit is the most costly component in an LCD panel, this still equated to a market value in the region of \$50 million. That slice of the

sector represents only a tiny fraction (0.4 percent) of the total available market, with a remarkable 277 million large LCD screens selling last year. But LED backlight shipments are now expected to increase rapidly, to 2.9 million in 2007 (0.9 percent of all large LCD backlights), 8 million in 2008 (2.1 percent) and 12 million in 2009 (2.8 percent). The 2009 figure ought to equate to a market value upwards of \$300 million.

GCS foundry deal signals shifting opto strategies

In a strategic move that highlights an accelerating shift towards outsourced wafer processing of optical telecommunication devices, Xponent Photonics has established a foundry deal with Global Communication Semiconductors (GCS). GCS, which is better known as a high-end GaAs wafer foundry that, among other things, makes RF components for US military applications, will manufacture optoelectronic

devices using proprietary laser and PIN photodiode processes developed by both Xponent and GCS.

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

Fiber-optic market forecast issued

Electronicast Consultants of Upper Lake, Calif., has released a market forecast study regarding the global total available market and consumption of fiber-optic components, devices and parts designed for applications in harsh environments. Consumption of these products has shown steady growth over recent years, and

the market is expected to rise in value from \$1.09 billion in 2005 to \$2.02 billion by 2009.

NL rebrands as Innolume; targets silicon photonics

"Innolume" is the new name for the US-German company formerly known as "NL Nanosemiconductor". The rebrand comes as the firm consolidates its acquisition of Zia Laser, and sets its sights on the emerging field of silicon photonics.

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

Philips announces 100% ownership of Lumileds

Royal Philips Electronics has obtained full ownership of Philips Lumileds Lighting, the world leader in high-power LEDs and pioneer in LED technology for every day purposes. Philips acquired last year the 47% stake in Lumileds owned by Agilent Technologies. The remaining 3.5% of Lumileds share capital has now been acquired from

Lumileds' employees and management. The 3.5% stake was related to an employee stock option program at Lumileds, which has now been replaced by a new incentive program. Philips will take a one-time charge of approximately EUR 8 million in its financial results for the fourth quarter 2006.

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

Techno News

LG pocket projector driven by Luminus LEDs

LG Electronics has unveiled what is described as the brightest commercially available LED-based pocket projector on the market, using a PhlatLight PT39 chipset from Luminus Devices. The Luminus chipset enables the LGE pocket projector to deliver more than 100 ANSI lumens, com-

pared with the 15 to 30 lumens produced by LED projectors currently available through retail channels. As a result, the LGE pocket projector can operate in daylight conditions and project a larger image with superior colour and image quality.

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



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Techno News

Future Sony televisions feature laser projection

Sony's future range of televisions will likely contain laser diodes, revealed the Japanese firm at the annual Consumer Electronics Show (CES) in Las Vegas. The electronics company, which describes itself as "transforming into an entertainment powerhouse", demonstrated a 55-inch television that uses a laser projection system. In Vegas, Sony also showed off a mammoth 82-inch television with an LED backlight. Sony first incorporated LED technology in its high-end televisions more than two years ago, but, in general, LED television backlighting has yet to take off in a big way. The US company Luminus Devices appears to

be leading the LED backlight field currently with its "Phlatlight" technology, which has been adopted by a number of television makers in rear-projection systems. Rival LED makers have also been gearing up with new MOCVD reactors in anticipation of a rapid expansion of the large-area display backlighting market for high-brightness LEDs. Sony also exhibited a prototype slimline 27-inch display that uses organic LEDs instead of III-V components. According to the company, mass production of similar 11-inch screens is close to being cleared, although the larger-area screens are still under development. With the Blu-ray and

high-definition DVD camps also trying to out-hype each other at CES, Sony was keen to point out that its US shipments of PlayStation3 games consoles - each of which features a blue-violet GaN laser diode - were on track over the recent holiday period. Despite reports of shortages of the consoles, senior VP of marketing for Sony Computer Entertainment America Peter Dille said that one million PlayStation3s had been shipped to the US by the end of December. Sony admitted previously that problems with GaN laser manufacturing had forced it to scale back the global launch of the PlayStation3 in November 2006.

Cree qualifies first 4-inch LED process

SiC and GaN chip manufacturer Cree says it has qualified 4-inch wafer processes for LED and Schottky diode fabrication. In an investor conference call to discuss its second-quarter 2007 results, Cree CEO Chuck Swoboda said that the switch to the larger format would help with production yields of large-area die typically needed for very-high-brightness, or "power" LED chips. This is because the "edge" effects that impact wafer yields become much less significant as the wafer manufacturing size is scaled up from 3 inches to 4 inches. Cree plans to switch a small amount of its LED and Schottky diode production to a 4-inch line in the current quarter.

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

Philips Lumileds reports 115 lm/W power LED at 350 mA

Philips Lumileds has claimed new performance records for high-power white LEDs with efficacies well in excess of 100 lm/W. The company expects that the enabling technologies behind these laboratory demonstrations will make their way into new and existing products, beginning in the current quarter. While other companies have announced results above the 100 lm/W threshold, these have all related to small devices driven at 20 mA. For example, Nichia recently announced a 150 lm/W lamp-type white LED demonstration. The Lumileds announcement shows that developments in the power LED segment are keeping pace with standard LEDs.

DOE releases draft Energy Star requirements for SSL luminaires

The US Department of Energy (DOE) has released draft requirements for the Energy Star program for LED-based luminaires. The draft document, "Energy Star Program Requirements for Solid-State Lighting Luminaires" describes how products targeting the general illumination market will be able to comply with program requirements. Energy Star is a voluntary labeling program designed to identify and promote energy-efficient products. The draft requirements have been posted on the DOE SSL website for review and comment.

http://www.netl.doe.gov/ssl/energy_star.html

You can send us press releases to mounier@yole.fr



Alliances & Mergers

CDT acquires OLED driver chip design house

Cambridge Display Technology (CDT) has acquired the assets of Next Sierra, Inc., a Mountain View, California-based hardware developer that specializes in designing driver chips for P-OLED and OLED displays. CDT believes that Next Sierra will assist in the development of Total Matrix Addressing™ (TMA) technology. "The response from the OLED industry to our announcement of TMA technology last month convinced us that we

needed to move quickly to demonstrate the TMA concept in silicon," said David Fyfe, CEO of Cambridge Display Technology. Total Matrix Addressing is a technology which potentially can be incorporated into driver chips to bring active matrix (AM) capabilities to passive matrix (PM) displays.

<http://www.cdttld.co.uk/>

Cyberlux acquires LED technology developed at UCSB

LED lighting manufacturer Cyberlux has acquired Hybrid Lighting Technologies, a company that holds a worldwide exclusive license for an inorganic light-emitting source for LEDs developed at the University of California-Santa Barbara (UCSB). Hybrid Lighting Technologies was previously a wholly owned subsidiary of UTEK Corporation,

and the deal was a restricted stock transaction. The technology acquired by Cyberlux enables the creation of a white or multi-colored lighting source by combining the emission from an LED chip with the photoluminescence from polymer and/or organic films.

<http://www.cyberlux.com/list.php>



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October issue no. 1/07 on "Chemical Micro Process Engineering" and on "Cross-sectoral Applications of MST"

a) New developments and trends in Chemical Micro Process Engineering; b) Case study on possible cross-sectoral applications of microsystem technology for accelerometers in the consumer industry and presentation of some other examples.

FORECAST

April issue no. 2/07 on "Smart Factory with MST" and on "Converging technologies"

a) What is "smart factory" at all and how it can be built-up with MST? Presentation of several smart factory developments and projects with "autonomous distributed (micro-)sensor systems" that are using MST; b) Presentation of trends towards complex miniaturized systems that are basing on bio-, micro/nano- and information technologies as well as on cognitive functions.

Deadline for press releases and advertisements: March 09, 2007; date of issue: April 05, 2007

Find all about mstnews, a subscription tool, media data and all (!) previous 77 issues at www.mstnews.de



Techno News

Revolutionary gas-to-liquids technology unveiled

French oil company, Total S.A. and microchannel technology firm, Velocys Inc. presented a revolutionary gas-to-liquids (GTL) process at the 6th annual GTLtec conference in Doha, Qatar. In November of 2005, Total S.A. and Velocys formed a multi-year alliance to apply microchannel process technology and highly active, nano-scale catalyst to produce syn-

thetic fuel from abundant natural gas. GTL represents a tremendous market opportunity since over 3,000 trillion cubic feet of natural gas are currently considered stranded – without access to world markets. The main objective of the development alliance is to make the conversion of natural gas to synthetic fuels more efficient, thereby enabling enhanced

development of natural resources. For GTL and other applications, Velocys' microchannel process technology offers reduced capital cost and higher efficiencies due to process intensification enabled by extremely high rates of heat and mass transfer.

www.velocys.com

VTI's 3-axis acceleration sensor for new biofeedback device

VTI Technologies is supplying its new SCA3000 3-axis accelerometer for a novel Swiss-made biofeedback device named ikcal, produced by Teltronic AG and commercialized with Medical Care Consulting AG. ikcal measures individual's calorie consumption through physical activity and compares this with their personal energy uptake in the form of food consumption on daily basis. In addition to the energy balance, the ikcal also indicates whe-

ther a person is exercising sufficiently. The physical activity is calculated by measuring the heart rate and the acceleration which are converted into kilocalories. The purpose of this kind of biofeedback device is to help fight chronic obesity. The VTI SCA3000 was selected due to its high accuracy and ultra-low power consumption.

www.vti.fi

Free Market Briefing

Microfluidics, the technological & economic potential at Lab-on-a-Chip World Congress



15 May 2007, 17:30 – 19:30
Edinburgh, Scotland

Take time to attend Yole Développement's Market Briefing

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- The organisation of the Microfluidic field and its main features

Lab-on-a-Chip World Congress reviews existing and new life science applications of Microfluidic technologies. Taking place in Edinburgh on May 15-16, Scotland, LOC World Congress has assembled a world class team of the best presenters in the Microfluidics field.

Market Briefing – Agenda Topics

- Focus on materials: polymer, glass and silicon
- Overview of microcomponents fabrication techniques
- Quantitative analysis 2005-2012
- Organization of the **Microfluidics** industry

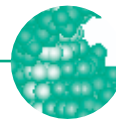
Market Briefing contact: Yole Développement, leroy@yole.fr
For further information, contact: k Saunders@selectbiosciences.com
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<http://www.selectbiosciences.com/conferences/LOAC2007/Agenda.aspx>



The Yole Développement magazine

February 2007 - n° 55



Techno News

Microfluidics gives boost to protein crystallization studies

Proteins produced by cancer cells are among the common targets for anticancer agents, and with efforts in proteomics and cancer genomics, the number of potential protein targets is increasing exponentially. One of the most powerful approaches to understanding protein function involves determining its 3D structure in atomic detail, but this requires having pure crystals to study. Until recently, protein crystallization has been more art than science, but now, two microfluidic devices have automated the process of crystallizing proteins.

University of Chicago's team led by Rustem Ismagilov, Ph.D., has developed a nanoliter

microfluidic device that can conduct approximately 1,900 crystallization experiments per hour. The device can vary the chemical conditions within 10 nanoliter plugs of fluid and then screen each plug to determine if the test protein forms high-quality crystals suitable for further study. Using their device, the researchers crystallized membrane-bound proteins, which experience has shown are among the most difficult to crystallize. The investigators were able to form crystals of a complex bacterial protein and use those crystals to determine the protein's 3D structure. The device is designed such that the investigators were able to conduct X-ray diffraction stu-

dies on the crystals while they remained in the microfluidic capillaries.

Taking a slightly different approach, but still using microfluidics, a research team led by Carl Hansen, Ph.D., at the University of British Columbia has developed its own version of a high-throughput crystallization device that varies crystallization parameters in an array-type format. The device can create up to 1,000 different mixtures of protein and other reagents and then can allow these mixtures to evaporate in a controlled manner, inducing protein crystal formation in those mixtures with the proper chemical conditions.

New glass micro-mixer technology platform

Micronit Microfluidics BV has launched its new glass micro-mixer technology platform. Mixing of fluids in microfluidics can be performed in various ways, using so-called folding flow techniques. Micronit and the University of Sheffield have worked on different mixing principles in glass microfluidic devices. They have focused on two mixer types: Tear-drop mixers for low Reynolds number mixing and Swirl mixers for high Reynolds number mixing. The Tear-drop mixer is ideally suited for "difficult" mixing, while the Swirl mixer performs best when very fast mixing is required. The micromixers result in efficient

mixing, even at low pressures. Micronit also announced it has chosen Kyodo International to be their representative for the Japanese market. Thanks to the fast-growing demand for Micronit's lab-on-a-chip products, the company indeed needed to expand its sales network. Kyodo's area of expertise lies in offering its clients different merits by selling products. Biotechnology is a key market for Kyodo.

www.micronit.com

New miniaturized device for Lab-on-a-Chip separations

Researchers at the National Institute of Standards and Technology (NIST) have develo-

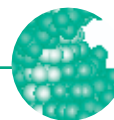
ped an elegantly simple, miniaturized technique for separating minute samples of proteins, amino acids and other chemical mixtures. A prototype device can run up to eight separations simultaneously in a space about the size of a quarter, highlighting the technique's potential for use in microfluidic lab-on-a-chip systems. The NIST technique, "gradient elution moving boundary electrophoresis" (GEMBE), works by opposing the movement of the mixture's components with a stream of buffering solution flowing at a variable rate. The technique has been validated at NIST with separations ranging from small dye molecules and amino acids to larger biomolecules, such as DNA. NIST is applying for a patent on the method.

www.nist.gov

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Business News

CardioMEMS files for \$86 million IPO

CardioMEMS, which makes innovative wireless sensors to monitor the heart, has filed with the Securities and Exchange Commission to launch an Initial Public Offering of stock worth more than \$86 million. The company, founded in 2001, a member of Georgia Tech's Advanced Technology Development Center, raised over \$50 million in venture backing, including a \$22.6 million round in December. The company's EndoSensor measures blood pressure in people who have abdominal aortic aneu-

rysm. Its HeartSensor is a wireless device that measures blood pressure in the hearts of patients with congestive heart failure.

www.cardiomems.com

Recruitment at Syrris

Syrris revealed that interest in its new flow chemistry (FRX) and atlas synthesis systems has been so high that it is now doubling its sales force. Since the launch of the FRX and atlas in late 2006, Syrris has delivered systems to major pharma companies and academic institutions throughout Europe and the US. With medicinal chemists increasingly moving to Syrris's new modular chemistry sys-

tems, Syrris is also appointing distributors to cover India (Nuilab Equipment Company), Japan (Hansen & Company), Italy (Stepbio) and Australia (John Morris).

www.syrris.com

Nomination at Fluidigm

Fluidigm has hired Dominique Remy-Renou to be vice president of European sales and support and general manager of Fluidigm Europe. Remy-Renou previously worked in the European organizations of Applied Biosystems, including country manager for ABI.

www.fluidigm.com

Alliance & Mergers

GE to acquire Abbott's in vitro and POC diagnostics businesses

General Electric Company plans to acquire Abbott's primary in vitro diagnostics businesses and Abbott Point-of-Care diagnostics business for \$8.13 billion in cash. The transaction is targeted to close in the first half of 2007. Abbott's in vitro diagnostics business, including Point-of-Care (former-

ly known as i-STAT), is expected to generate net sales of approximately \$2.7 billion in 2006. This will transform GE Healthcare into the world's second-biggest in vitro diagnostics player behind Roche, thus answering Siemens' challenge.

www.ge.com

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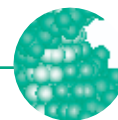
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Alliance & Mergers

RainDance's new microfluidic, microdroplet chip

RainDance Technologies used Cambridge Consultants' design and engineering development services to develop its Nanoreactor™ micro-droplet-based system aimed at rapidly sorting through vast sets of biochemical entities. By delivering the instrumentation in just six months, Cambridge Consultants allowed RainDance to speed time to market by several months. RainDance's offer is targeting a broad range of markets including drug development, cancer research, and even industrial biofuels. RainDance's Personal Laboratory System™ (PLS) combines Cambridge Consultants' developed instrumentation with unique disposable fluidic chips to generate and

combine droplets – then optically interrogate and sort them according to assay activity. Processing samples at up to 10,000 droplets per second, this platform delivers significantly faster, cheaper and more accurate analysis than traditional life science tools. With also approximately \$170,000 in NIH funding, the company plans to deliver reference platform units for early adopter use in spring 2007 and to launch the system in January 2008. But first, the company faces the tall order of distinguishing its product from those offered by established microfluidic tool vendors Caliper and Fluidigm.

<http://www.raindancetechnologies.com>

OGT, Agilent Partner on Microarray Development

Oxford Gene Technology (OGT) and Agilent Technologies announced a collaborative agreement giving OGT access to Agilent's microarray platform, confirming OGT as an Agilent Certified Service Provider, and appointing Agilent as an OEM supplier for OGT designed microarrays.

OGT and Agilent, joint pioneers of the development of the Ink Jet in-situ synthesis (IJISS) and SurePrint™ platforms, will combine the experience and expertise of OGT in microarray services with Agilent's microarray platform to provide an end-to-end solution, giving the customer a flexible platform using high density, high sensitivity microarrays, tailored to application services.

OGT and Agilent also plan to jointly develop a Centre of (Microarray) Excellence targeting new emerging applications including aCGH, ChIP, methylation and microRNA.

www.agilent.com

MDS to Buy Molecular Devices for \$615M in Cash to Expand MDS Sciex Business

MDS has signed a definitive agreement to buy Molecular Devices, a maker of high-content screening, cellular analysis, and biochemical testing tools, for \$615 million in cash. MDS will create a new 1,100 employees business segment that combines Molecular Devices with its MDS Sciex business. MDS Sciex business will continue its mass spectrometry partnerships with Applied Biosystems and PerkinElmer following the transaction. Molecular Devices will generate \$190 million in revenue and \$45 million to \$50 million in earnings in the first year. Molecular Devices reported \$185 million in revenue in the four consecutive quarters ended Sept. 30, 2006. The transaction is expected to close in the second quarter.

www.moleculardevices.com

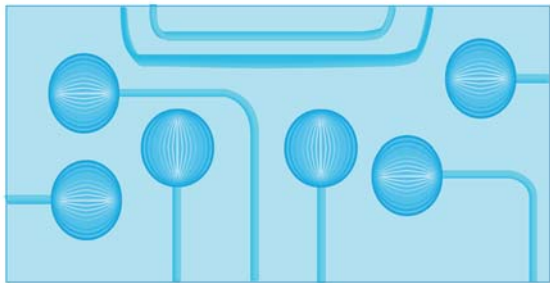
Cepheid and BioMerieux to develop and market sepsis assays

Cepheid and BioMerieux plan to develop and market a line of sepsis tests. They will develop assays to identify fungi and bacteria and genetic markers for antibiotic resistance, a panel that could also be used to identify hospital-acquired pneumonia. The tests will work on Cepheid's GeneXpert platform. Cepheid will manufacture them and BioMerieux will distribute them worldwide.

As part of the deal, BioMerieux has licensed Cepheid patents for its methicillin-resistant *Staphylococcus aureus* test. Cepheid will continue to develop, manufacture, and market the products.

Financial terms of the agreement were not released.

www.cepheid.com



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Welcome to the Lab-on-a-Chip World Congress; our inaugural conference designed to review existing and new life science applications of microfluidic technologies. This meeting will be held in the beautiful and historic city of Edinburgh, allowing close proximity to Scotland's growing biotech community, universities and research institutions.

Registration for this conference will also permit access to the co-located Advances in Microarray Technology and SEQNSYNTECH.



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Jon Cooper
Head - Bioelectronics Research
Centre
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Craig Venter
Founder and President, J. Craig
Venter Institute and the J. Craig
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Andrew De Mello
Professor of Chemical Nanosciences
Imperial College



Sabeth Verpoorte
Program Chair
Institute of Pharmacy, University
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Andreas Manz
Head - ISAS, Dortmund

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We are currently accepting submissions for poster presentations. If you would like to be considered, please complete the submission form at Lab-on-a-Chip.net.

Agenda topics will include :

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- Protein quantification
- Microfabrication/engineering
- Genomics & drug discovery applications
- Micro-Reactions

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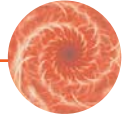


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Photovoltaic at Yole

At Yole Développement, three consultants are working on photovoltaic (PV) market for now 2 years. We investigated the PV industry in order to help our customers to understand the market evolution in terms of structure and technology and see how they should customize their offer to benefit from the impressive booming of PV business.

We are working with industrial companies in order to define their market and technology strategy but also the investments needed for market entrance. We plan to release a report on this topic within the next two months. The report crosses market data,

technologies and processes description and quantifies the opportunity for equipment and materials manufacturers. We have been working both on established processes (Si wafer based, Si thin wafer based, amorphous Si) and emerging ones (tandem a-Si/ μ -Si, CIS/CIGS, CdTe, III-V, DSSC, Organic)

Next month will present a more detailed content of the report and a precise release date.

For more information on our activities within the photovoltaic filed, feel free to contact Gaetan RULL at: rull@yole.fr

Techno News

New World Record in Solar Cell Efficiency Achieved Using a Veeco MOCVD System

Veeco Instruments Inc. announced its Metal Organic Chemical Vapor Deposition (MOCVD) technology enabled an important recent advancement in solar cell efficiency. On December 5, Spectrolab, Inc. (The Boeing Company) has achieved a world record concentrator solar cell conversion efficiency of 40.7 percent. This solar cell conversion efficiency was achieved using a Veeco TurboDisc(R) As/P MOCVD System, which deposits epitaxial films.

The 40.7 percent efficient cell was developed using a multi-junction solar cell structure. This type of cell achieves a higher efficiency than single junction cells by capturing more of the solar spectrum and utilizing it more efficiently. The solar cells are manufactured in a single epitaxial growth process, which requires excellent control and repeatability from the MOCVD system.

<http://www.veeco.com>

<http://www.spectrolab.com>

Business News

Q-Cells signs long-term supplies agreement with Elkem Solar and acquires equity stake in REC

Q-Cells AG has signed a long-term supply agreement with Elkem Solar, a member of Norway's Orkla Group, thus securing supplies of significant quantities of metallurgical silicon to lock in growth in its core business until 2018. By conducting extensive tests on the manufacture of ingots, wafers and solar cells, Q-Cells has confirmed that the material supplied by Elkem Solar - to be industrialized on a large scale - can achieve efficiencies

and yield levels equivalent to high-purity polycrystalline silicon, which is manufactured using a much more expensive and complex process. In connection with the agreement on silicon supplies, Q-Cells AG will acquire 17.9 % of the share capital in REC Renewable Energy Corporation ASA, from Good Energies.

<http://www.qcells.de>

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

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

First Solar Announces 100MW Manufacturing Plant Expansion in Malaysia

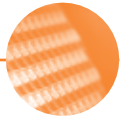
First Solar Inc, a CdTe solar module manufacturer, announced it will expand production with a new four-line plant with an expected minimum annual capacity (or nameplate capacity) of 100MW. The manufacturing plant will be located in Kulim Hi Tech Park located in Kedah, Malaysia and when fully ramped will employ approximately 500 people. Plant construction is scheduled to begin in April 2007 and conclude late in 2007, with production planned to begin in the second half of 2008. The

total plant investment is estimated to be \$150M. The Malaysian government is providing a 15-year income tax holiday as an incentive for First Solar's investment in Malaysia. The manufacturing site can accommodate future expansion.

First Solar currently operates a manufacturing plant in Ohio with 75MW nameplate capacity and is in the process of completing a manufacturing plant in Germany with 100MW nameplate capacity.

<http://www.firstsolar.com>

You can send us press releases to rull@yole.fr



Life & Death

What future for the Crolles2 Alliance?

After the NXP announcement in the middle of January, Freescale Semiconductor Inc. also announced on Jan. 23 that it would not extend its participation in the Crolles2 Alliance beyond the term expiring at the end of 2007. Crolles2 Alliance is a high-profile alliance created in 2000 in Crolles, France, by STMicroelectronics Inc. and Philips Semiconductors (now NXP), joined later by Freescale. The alliance works on R&D and industrialization of CMOS process technologies, from 90-nm to the 32-nm node. According to Frans van Houten, CEO of NXP BV, the Dutch company has

chosen to work more closely with Taiwan Semiconductor Manufacturing Co. Ltd. resulting in increased R&D activity by TSMC in Leuven, Belgium with NXP and IMEC. He confirmed NXP would remain involved at Crolles up until the end of 2007 when the partnership contracts end, relating to work on a 45-nm CMOS process. NXP employs about 200 people at Crolles.

Concerning Freescale, officials insisted that the US-based company is not exactly bailing out of the alliance, which consists of two components: R&D and IC manufacturing. It is

still unclear what direction Freescale will take in the manufacturing portion of the contract at Crolles2, which has a small-scale, 300-mm fab. Freescale Semiconductor Inc. announced plans that it will join IBM Corp.'s "fab club" for joint semiconductor R&D. Freescale will become a partner in IBM's technology alliance starting at the 45-nm node and will also participate in the R&D alliance at the 32- and 22-nm nodes and beyond. The agreement includes the development of CMOS and silicon-on-insulator (SOI) technologies.

<http://www.nxp.com>

<http://www.freescale.com>

<http://www.st.com>

TSMC to open 300-mm fabs in the next few years

Foundry giant Taiwan Semiconductor Manufacturing Co. Ltd. plans to build five advanced 12-inch wafer plants in Taiwan within the next few years.

Building five fabs could cost TSMC (NYSE:TSM) as much as \$15 billion. On the plants' completion, TSMC will have a total of seven 12-inch factories in Taiwan. The company's decision to continue development in its home country seems a strong statement of its loyalties there, as the company now has more flexibility than ever to expand in neighboring

China. Despite lingering political tension between the two countries, Taiwan's government officially gave permission to three Taiwan-based companies to invest a combined \$825 million in China. And at the beginning of January 2007, Taiwan's government green-lighted a plan to allow Taiwanese chip-makers to use the more advanced 0.18-micron technology in their China factories. Currently, TSMC has one wafer plant in Shanghai.

<http://www.tsmc.com>

Intel strategic decisions in Israel

The giant chipmaker Intel Corp. has confirmed its intention to close Fab 8 in Jerusalem, Israel. The wafer fab closure is a result of the company's decision to stop all its automotive controller activities by the end of 2007, said a report from Reuters. Intel could also sell its NOR flash memories activities to STMicroelectronics or Sony-Ericsson, including its existing fab at Kiryat Gat in southern Israel, Fab 18. According to the reports, Fab 18 will either be sold

or be reclassified by Intel itself in the near future. Meanwhile, Intel reportedly is set to mobilize plans to invest in a major new plant in China to make leading-edge chips. The plant, which will make 65nm multi-core processors, is rumored to cost over \$2 billion—Intel's biggest investment in China to date, according to the Reuters report that cited "two sources with knowledge of the plan."

<http://www.intel.com>

Alliances & Mergers

Canon Marketing Japan and Obducat have signed distribution agreement

Canon Marketing Japan and OBUDUCAT AB are pleased to announce that the two companies have signed an exclusive distribution agreement for Obducat's products in Japan. Under the terms of the agreement Canon Marketing Japan will exclusively market and support Obducat's products throughout Japan. Obducat develops products and processes used for replication of advanced micro and nano structures. Obducat is currently supplying its Nano

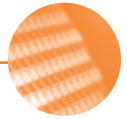
Imprint Lithography (NIL) technology and is looking to distribute in Japan. Canon Marketing Japan is the domestic marketer of all Canon Inc. products. Its Industrial Equipment Division is involved in sales and servicing of Canon's Semiconductor Equipment, Equipment for LCD Displays as well as various measuring tools.

<http://cweb.canon.jp>

<http://www.obducat.com>

The Yole Développement magazine

February 2007 - n° 55



Business News

Dalsa reports 4th quarter 2006 for Semiconductor business

Dalsa Semiconductor Business revenues decreased by \$0.5 million or 3.3% in the fourth quarter of 2006 compared to the same quarter in 2005. The decrease was mainly the result of delays in orders from customers in foundry CMOS business and in IC products business (which includes image sensors), which rescheduled deliveries into early 2007 to minimize their year-end inventories. Dalsa also experienced some supply issues on a specific and limited range of materials in their semiconductor wafer processing facility. Revenue from MEMS devices grew by \$0.3 million compared to the same quarter in

2005, and for the first time revenues from the MEMS end market were the largest contributor to total revenue for the semiconductor wafer processing facility. Lower revenue in the IC products unit resulted in losses during the current quarter, although the wafer processing facility was profitable in the quarter. As evidenced by the backlog, which increased from the previous quarter by \$6.7 million to \$39.7 million, management expects quarterly revenue to rebound in the first quarter of 2007.

<http://www.dalsasemi.com>

Market Focus

Innovative 3D packaging technologies

NEW REPORT

How it will impact the semiconductor food chain? Technology and Market analysis of the 3D packaging solutions

Our world is today at the crossroads of numerous breakthroughs in 3D stacking!

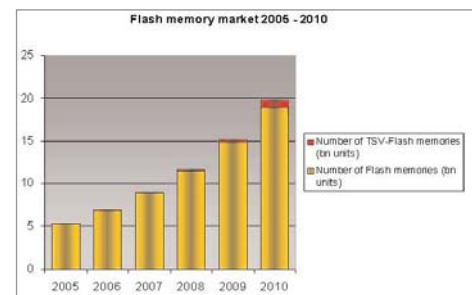
Although 3D ICs are at the R&D stage in the largest semiconductor companies today, the recent announcement of Samsung in 2006 could speed up micro-via technology especially for the memory business. By acquiring the new Yole 3D IC report, you will have access to a Technology and Market analysis on 3D packaging solutions.

3D integration will affect the IC, MEMS and image sensors markets!

Semiconductor chips face constant pressure for increased performances while still decreasing their size. At the same time their packages must be able to accommodate new functionalities.

Today wire bonding is limited in density and performances so 3D stacking with micro-vias (or TSV, "through-Si vias") seems to be unavoidable in the future for miniaturization first and increased performances after.

3D integration will use technologies originally developed for MEMS technology but for different markets.



Market Forecast for TSV-based Flash memories

In 3D IC report, Yole Développement has analyzed that portable applications are a strong market driver for 3D integration. Stacking memories, stacking memories and logic, image sensors with μ P and FPGAs will be the first mass market applications.

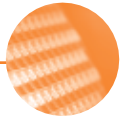
In 2010, Yole's experts forecast that 1 billion of Flash memories will be stacked with TSVs (see figure 1).

3D-ICs: the technical challenges are close to be overcome

3D is the most "integrated" approach and is an enabling technology platform applicable to digital and mixed signal electronics, wireless, electro-optical, MEMS, sensors, smart imagers, displays and other devices. There are however strong challenges. They are: thermal management, reliable co-design and simulation tools, and industrial wafer-to-wafer bonding tools, low-cost through-wafer via structures and via fill processes.

For more information on this report, please go to www.yole.fr or ask Fayçal El Khamassi (khamassi@yole.fr +33 472 83 01 95)

You can send us press releases to mouly@yole.fr



Business News

November 2006 chip sales up 11.3%

The Semiconductor Industry Association (SIA) reported that global sales of semiconductors reached \$22.7 billion in November, an increase of 11.3 percent from the \$20.4 billion in November 2005. Sales increased by 3.1 percent from the \$22.0 billion reported in October. The November sales figure was the fifth-consecutive month of record sales. For the first 11 months of 2006, worldwide semiconductor sales totaled \$225.1 billion, an increase of 9.4 percent from the like period of 2005 when sales were \$205.7 billion. "Despite some signs of slower economic growth in the fourth quarter, consumer purchases of electronic products remained strong and again drove semiconductor sales to record levels," said SIA President George Scalise.

November 2006 (\$ Billions)			
Month-to-Month Sales			
Market	Last Month	Current Month	% Change
Americas	3.99	3.97	-0.5%
Europe	3.54	3.68	4.0%
Japan	4.15	4.25	2.6%
Asia Pacific	10.34	10.79	4.4%
TOTAL	22.02	22.70	3.1%
Year-to-Year Sales			
Market	Last Year	Current Month	% Change
Americas	3.73	3.97	6.5%
Europe	3.53	3.68	4.3%
Japan	3.77	4.25	13.0%
Asia Pacific	9.38	10.79	15.0%
TOTAL	20.41	22.70	11.3%

Source: SIA, January 2007

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

2007 predicted as a positive year for IC equipment market

The semiconductor industry ended 2006 on a high note, announced VLSI Research. Worldwide sales of semiconductor and related equipment soared to \$61B, an increase of 19% from 2005. At the same time, sales of integrated circuits reached \$209B, 8.5% above the 2005 level. Following a bountiful 2006, the semiconductor industry is expected to continue expanding in 2007, but at a lower rate. VLSI Research predicts IC revenues will increase 5.2%, while the equipment market will grow at 4.8%. Utilization rates were still high during the

fourth quarter of 2006, averaging 92% in Wafer Fabrication, 92% in Test, and 94% in Assembly. Conditions are pointing to another positive year said the market research company, but there are pressure points to watch for: equipment order growth is slowing, die banks are still growing, and VLSI's Chip Price Performance Index, while still positive, is pointing to a pricing environment that is deteriorating fast.

<http://www.vlsiresearch.com>

LAM Research announces 4Q06 financial results

Lam Research Corporation announced earnings for the quarter ended December 24, 2006. Revenue for the period was \$633.4 million and net income was \$167.3 million, or \$1.15 per diluted share, compared to revenue of \$604.4 million and net income of \$183.5 million, or \$1.27 per diluted share for the September 2006 quarter. Ongoing net income was \$167.3 million, or \$1.15 per diluted share in the December 2006 quarter compared with ongoing net income of \$163.9 million, or \$1.13 per diluted share,

for the September 2006 quarter, reflecting the Company's investment in support of its long-term market share and product growth objectives.

In 2007 Lam Research seeks to continue achieving the benefits of their business model and expand upon the momentum in their core etch businesses. The company is making excellent progress in its activities associated with expansion into markets adjacent to etch.

<http://www.lamrc.com>

Techno News

Picogiga announces pre-production of SopSiC substrate

Picogiga International, a division of the Soitec Group announced pre-production availability of SopSiC, a Smart Cut(TM) engineered substrate for GaN-based power devices. Silicon-on-polysilicon-carbide (SopSiC) bridges the compound epiwafer void between low-cost, low-power gallium nitride (GaN) on silicon and high-cost, high-power SiC for GaN HEMT devices. As such, SopSiC is designed

to provide cost-efficient substrate solutions for advanced high-power devices used in wireless (RF) communication systems such as radar, satellite communications and base stations. The SopSiC structure includes: a bottom layer of polysiliconcarbide, an insulating buried oxide layer, and a high resistivity (1-1-1) silicon top layer.

<http://www.picogiga.com>



Free Market Briefing

- **Optical MEMS and LEDs/LDs light modules**, a new business opportunity for the MEMS companies at Smart Systems Integration - March 28th (Paris, France)
- **Discover technological & economic potential of Microfluidics** at Lab on a Chip World Congress - May 15th (Edinburgh, Scotland)

Contact: [Sandrine Leroy, lero@yole.fr](mailto:Sandrine.Leroy@yole.fr), +33 472 83 01 89

Our reports

3D IC Report: Innovative 3D packaging technologies	Innovative 3D packaging technologies: market and technological challenges for 3D integration. How it will impact the semiconductor food chain?	Price: Euros 3,990 February 2007
MicroReaction Technologies	Microtechnologies for chemical process intensification: What are the market status and its evolution? Overview of products, suppliers and users.	Price: Euros 3,490 February 2007
MOEMS, LEDs and LDs for lighting	MOEMS and lighting sources for new display applications. A business opportunity for MEMS companies?	Price: Euros 3,990 March 2007
EMMA 07	Emerging markets for microfluidics technology: possible industrialisation process, focus on materials and quantitative analysis 2005 - 2012.	Price: Euros 2,990 March 2007

Other available reports

- **WMF**, an Excel database with details on more than 480 MEMS players worldwide - Available since November 2006. Price: Euros 1,490.
- **Global MEMS/Microsystems – Markets and Opportunities** (Yole /SEMI report) - Available since September 2006. Price: Euros 2,000.
- **PowerSiC** - Status & forecasts silicon carbide devices for power electronics market - Available since May 2006. Price: Euros 3,900.

For prices in Dollars, please contact us.

Contact

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To meet us at exhibitions

- Booth # D-08. at **nano tech 2007**, Tokyo, Japan, February 21-23, please contact Barbara Pieters at pieters@yole.fr
- Booth # 12 at **Device Packaging**, Scottsdale, Arizona, USA, March 19-22, please contact Éric Mounier at mounier@yole.fr
- Booth # 3177 at **Semicon China**, Shanghai, March 21-23, please contact Jean-Christophe Eloy at eloy@yole.fr

About Yole Développement

Our commitment is to facilitate market access for innovative technology, devices, equipment and materials in the MEMS, compound semiconductor, nano and life science fields. Founded in 1998, Yole Développement is involved in different fields, with strong leadership worldwide:

- MEMS
- Compound semiconductor
- Equipments & Materials for MEMS/Semiconductor manufacturing
- Micro and nanotechnologies for Life science and chemistry
- Nanomaterials
- Photovoltaic and palm power areas

Our services and publications include following:

- Market research
- Technology analysis
- Strategy consulting
- Operational marketing
- Market reports & database
- Company profiles
- Micronews free magazine
- MEMSentry monthly bulletin



Jean Christophe Eloy is the founder and Managing Director of Yole Développement.