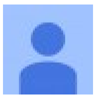
Application driven technology: Nanoelectronic for Healthcare (TechARENA)



D. Louis
International Communication Manager
Cea-Leti, Grenoble, France

Biography

Since joining CEA-Leti in 1985, Didier Louis has held a variety of positions in microelectronics research. In 2000, he served as the manager of the etching and stripping R&D laboratory, and from January 2004 to December 2007, he was deputy manager of the BEOL Laboratory. In 2008, he was named the deputy manager of Leti's Materials and Advanced Modules Laboratory and public relations manager of the Nano-Electronic Division. In 2010, Louis joins the directorate staff of Leti as Corporate and International communication Manager.

He plays an active role in the organization of several International conferences such as IITC (International Interconnect Technology Conference), MNE (Micro and Nano Engineering), PESM (Plasma Etch and Strip in Microelectronics) and AVS-ICMI (during 3 years).
He is a member of ITRS committee in the interconnect group.
He is a member of SEMI STC and SEMI Award Group.

Louis graduated from Electro-chemical en Material Engineering Scholl.

Medical & healthcare: What are the opportunities for MEMS and sensors?

F. Breussin
Business Unit Manager MEMS & Sensors
Yole Developpement, MEMS & Sensors, Lyon, France

Abstract

The medical and healthcare market are nowadays considered by most electronics and semiconductors suppliers as a new growth opportunity. The potential is huge, ranging from high value/high margin medical devices to health consumer products for wellness and fitness.
As part of this market, Wearable electronics is a significantly growing market, mainly driven by smart watches. Many products are already on the market, measuring physical and physiological parameters, which are transferred to a base station (typically a mobile phone). Added value is then created by specific "smart" applications.

To feed these applications with data, the demand for all types of so-called bio-sensors is significantly increasing and affecting the way the sensor industry is organized. Pressure sensors, IR sensors, microfluidic chips, chemical and gas sensors are just few examples. Yole Développement will provide an overview of the

applications and the challenges industry will face to enter this market.

CV of presenting author
Frédéric Breussin is responsible for the MEMS and Sensors activity. He has supported many companies in their innovation and product development strategy in making the bridge between micro systems technologies and their applications in consumer, automotive, industrial, Life sciences, diagnostics and medical device industries. He holds an Engineering diploma from INSA Rouen & a DEA in fluid mechanics from University of Rouen.

Implantable Glucose BioFuel Cells

P. Cinquin
Director
UJF / CNRS / CHU Grenoble, Grenoble, France

Abstract
An Implantable BioFuel Cell (IBFC) is a device that produces power only from the chemicals that are naturally occurring inside the body. We have been working on two approaches to creating an IBFC. The first approach is to use chemicals such as glucose and oxygen to provide the fuel for an enzymatic IBFC. The second approach is to use electrolytes such as sodium to provide the fuel for a biomimetic IBFC.

We have demonstrated the feasibility of implanting in rats the enzymatic biofuel cells that are capable of utilising glucose and oxygen from the physiological fluids to create power for other implanted medical devices. We were able to obtain a power to volume ratio of the order of magnitude of 1 µ*** W. µ*** L-1 and to demonstrate the stability of the device during 3 months. We are presently optimizing the device, notably by using printing techniques for the fabrication of the electrodes and by exploring the potential of porous silicon for the packaging.

Another type of IBFC involves a biomimetic approach. This biofuel cell generates electricity by imitating salt transport that occurs naturally in the cells of the body: electrolytes such as sodium are used to provide the fuel for power generation. At the heart of the device is a lipid bilayer containing transport proteins similar to the ones naturally occurring in a cellular membrane. Gradients of sodium are then transformed into voltage and power. Preliminary results show that a biomimetic membrane of 0.3 cm2 can produce an output of 59 µ*** W, which is encouraging since such membranes are able to be easily stacked in series and in parallel.

The very interesting power to volume ratio opens interesting perspectives of applications of IBFCs, for instance to power implantable medical devices such as lead-less pacemakers or robotic artificial urinary sphincters.

CV of presenting author
Philippe Cinquin, 58, is Professor of Medical Informatics at Grenoble University (France). He heads TIMC-IMAG, UMR5525, a Research Unit of CNRS and of Universite Joseph Fourier, CAMI (Computer Assisted Medical Interventions) Labex, and co-heads CIC-IT 803 (Centre of Clinical Investigation - Technological Innovation) of INSERM, Grenoble's University Hospital and Joseph Fourier University. He holds a PhD in Applied Mathematics and is a Medical Doctor. In 1984, he launched a research team on Computer-Assisted Medical Interventions (CAMI), which led to innovative surgical practice, benefiting to more than 100 000 patients, thanks to the creation of several startup companies. He recently turned on intra-body energy scavenging in order to power implanted medical devices. He was the recipient of the 1999 Maurice E. Muller Award for excellence in computer-assisted orthopedic surgery, of the 2003 CNRS Silver Award, of the 2013 CNRS Innovation Award and of the 2014 Ambroise Pare award of the French Academy of Surgery. He is a member of the French Academy of Surgery. He is co-lead inventor of the "Biofuel cell with glucose" patent, which is finalist of the 2014 European Inventor Award.

Active implantable medical devices requirements for Nanoelectronics

R. Dal Molin
Director of Scientific and Technical Coordination
SORIN CRM, Clamart, France

Abstract

Active implantable medical devices have already a long history of innovation for improving their reliability and robustness, for decreasing their size, for increasing their longevity, for increasing their functionalities, for decreasing the cost of the therapy.

There are still some barriers that limit their use in a much greater way than it should be.

Barriers like:

- Affordability by patient or healthcare system
- Lack of evidence of cost-risk benefit
- Acceptance by patient of an implant
- Removal of the active implantable medical devices
- Reliability of the active implantable medical devices

In the presentation we will discuss how nanoelectronics can help to improve the use of active implantable medical devices.

CV of presenting author

Renzo Dal Molin is the Director of Scientific and Technical Coordination for SORIN CRM (Cardiac Rhythm Management), which is a business unit of SORIN GROUP.
He is responsible for research mainly conducted in
European projects.
His scope is to bring innovation in pacemakers, implantable sensors and defibrillators, active implantable medical devices communication and home monitoring systems.
He is Vice Chairman of EPoSS,(European Technology Platform
on Smart Systems) Chairman of Working Groups Smart Systems
for Healthy Living and Applied Micro-Nano-Bio Systems.
He is very active in telecommunication standardization as
he was involved in ECC reports 149 and 150 published by the European Communications Office and rapporteur of ETSI
standards EN 301 559 and EN 301 489-35. He is Project Coordinator or SORIN CRM responsible for European or national projects.
He has a 34 years experience in bioelectronics, ASIC design, Microelectronics Packaging, Interconnect and Assembly.
He obtained his master in Electronics and Biomedical Engineering in 1979 from ESSTIN and University of Nancy
France.
He then occupied in SORIN CRM different positions like
hardware & software project engineer, pacemaker & defibrillator project manager, MEMS analog&digital integrated circuits design manager.
He holds more than 20 US and European patents.

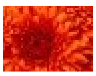
What MEMS can bring to medical devices : selected examples

L.-D. Piveteau
Chief Operating Officer
Debiotech SA, Lausanne, Switzerland

Abstract
MEMS are being used today in many industrial applications, from automotive to consumer electronics. In the field of medical devices their presence is increasing steadily. Debiotech is developing since nearly 25 years highly innovative medical devices and has been among the precursors in introducing MEMS into the medical arena. Through two examples, the JewelPUMP used for the treatment of diabetes and the DebioJect microneedles system for intradermal injection of vaccines, we will show how MEMS devices are generating new opportunities for the benefit of the patients.

CV of presenting author
Laurent-Dominique Piveteau is Chief Operating Officer at Debiotech SA. He holds a MSc from ETH Zurich (Switzerland), a PhD from the University of Fribourg (Switzerland) and an MBA from INSEAD in Singapore and Fontainebleau (France).
After his PhD on ceramic bioactive coatings for medical implants, he has occupied different positions in R&D and business development. He was post-doctoral research fellow at MIT in Boston (USA), working on innovative targeted drug delivery systems in the group of Robert Langer. He was head of the scientific marketing for Evologic, a French biotechnology company specialized in controlled evolution. He was Industrial Liaison Officer at the Ecole Polytechnique Fédérale de Lausanne, in charge of establishing partnerships with industry for the School of Life Sciences.
Laurent-Dominique is author and co-author of 19 scientific and business papers and 12 patent families.

Akribis-Air: A new innovation in wafer processing



K. Forsyth
Sales Manager
Logitech ltd, Sales and Marketing, Glasgow, United Kingdom

Abstract
Logitech Ltd are world leaders in materials processing, shaping and surface finishing technology.
We specialise in the design and manufacture of high precision cutting, lapping and polishing systems which enable high specification surface finishes to be prepared with precise geometric accuracy.
Logitech systems provide exacting standards of material flatness and parallelism and are used to process fibre optic, laser, opto-electronic and semiconductor materials.
The Akribis-Air is the latest edition to our lapping and polishing range and offers the ultimate in intelligent, integrated and fully automated processing of wafers.

We will present the full features and benefits of the Akribis System , focusing on the optimised processing of hard materials such as SiC

CV of presenting author
Kirstin Forsyth is the European Technical Sales Manager for Logitech Ltd.
After graduating at the University of Strathclyde with a Masters degree in Chemistry, Kirstin worked in R&D, manufacturing and commercial roles for 6 years within the polymer manufacturing industry before joining Logitech in 2014.