FORWARD AS ONE
SEMICON® EUROPA

SMARTx - SMART MedTech

Gas and particle sensors, electronic noses in healthcare sector - a new momentum

J. Mouly
Team Lead Analyst Sensing & Actuating
Yole Développement, Photonics & Sensing,
Villeurbanne, France

Abstract
The quality of the air we breathe remains a major global issue for the health and safety of people. The World Health Organization links 4.2 million deaths per year to pollution issues and exposure to toxic or dangerous gases. The cost of pollution is also a significant economic impact. The World Bank estimates it to be 4.8% of global GDP. Covid-19 pandemic has accelerated the adoption of indoor air quality detectors in which gas and particle sensors are at the heart of the systems, analyzing CO2 concentration in public closed areas, classrooms, or offices, and many countries are now regulating air quality in these areas. In the medical sector, gas sensors are used for capnography applications since a long time, but new use cases are into development or exploration status: cancer biomarkers in air we breathe for early diagnostics, inflammation detection for patient suffering from Asthma. The presentation will describe applications of gas and particle sensors in the healthcare sector and emerging use cases. You will learn more on the innovative technologies from NDIR to MOx or photo acoustic based gas sensors, and which kind of technology is well adapted to which application regarding selectivity, lifetime and other major criteria for healthcare applications. Not only gas could be measured, but also more complex odors that need to the use of artificial intelligence or the concept of electronic nose. The presentation will introduce electronic nose devices and status of development as well as the ecosystem of players.

Biography
Jérôme Mouly is Team Lead Analyst in the Sensing & Actuating team within the Photonic & Sensing Division at Yole Développement (Yole).
Jérôme manages the expansion of the technical expertise and market know-how of the team. He actively supports and assists in the development of a dedicated collection of market & technology reports as well as custom consulting projects.
He has conducted more than 100 marketing and technological analyses for industrial groups, start-ups, and institutes in the field of MEMS and sensing technologies.
Jérôme has been also deeply engaged in Yole's finance activities with a dedicated focus on the commercial exploitation of smart system technologies and access to funding opportunities.

Application-Specific Integrated Circuits Pave the Way to New Innovative Electro-Therapies for Cardiology and Neurology

E. Bernard-Moulin
Marketing Manager
IC'Alps, Meylan, France

Abstract

Cardiology is the second-biggest medical device area by sales on account of rising prevalence of cardiovascular diseases (CVDs) – number one cause of death worldwide –, favorable reimbursement policies, growing geriatric population and increasing cost of CVD management. EvaluateMedTech estimates that the cardiology market could hit a valuation of nearly $75 billion worldwide by 2024, dominated by few medtech companies.

When drug based therapies of cardiovascular diseases are not sufficient or do not have enough care efficiency, one growing curative approach of patients is to use dedicated Active Implantable Medical Devices (AIMD) leveraging Application-Specific Integrated Circuits – so called ASICs –. Trends to watch in ASIC-powered medical devices include energy harvesting and battery management for long-term care, less invasive technologies for patient comfort, machine learning for predictive analytics and personalized treatment, simultaneous and continuous monitoring of biosignals for simpler and accurate diagnostics, and cybersecurity for patient safety. As these novel approaches enter the market, we are seeing HealthTech startups tackling heart failure with innovative products such as leadless pacemakers, cardiac contractility modulation devices or cardiac micro-current devices.

Microelectronics and Application-specific Integrated Circuits (ASIC) could not only broaden the competitive landscape in cardiology, they are also revolutionizing our medical approach to neurology: spinal cord, vagus nerve or peripheral nerves neurostimulation, brain fine monitoring and electrostimulation, etc.

Relying on advanced design techniques developed through decades of experience in the downscaling of power consumption coupled to the highest integration level, IC'Alps proposes custom integrated circuits embedding nanopower electrogram (ECG/EGM/EEG…) with very limited Bill of Material (BoM), ultra-efficient Power Management Units (PMU), power optimized neurostimulation stages and many more blocks to build a customized electronics for AIMD manufacturers. Such disruptive IC design architectures have proven their effectiveness in improving quality of healthcare and patient's lives in many applications.

In the near future, implantable devices based therapies that have never been envisioned will be possible with our technology.

Biography

Elsa is Marketing Manager at IC'Alps since 2019.

She is currently responsible for market analysis, global promotion of IC'Alps' design expertise, stimulation of the ecosystem, identification of new business & partnership opportunities and supports R&D topics.

She started her career in the semiconductor industry in 2008 and covered different topics ranging from silicon IP blocks, semiconductor equipment and ASIC design & supply services.

FlexPoint – A novel inspection methodology to address typical MEMS wafer inspection challenges

P. Egger
Senior Manager
Bosch, Reutlingen, Germany

Abstract

Presentation Description

MEMS devices serve a wide range of sensor applications in today's smartphones, tablets, wearables, drones, robots, automobiles, and variety of smart devices – but manufacturing of these devices involves advanced processes that require tight process control. This presentation explores some of the typical challenges that are seen during the manufacturing of a MEMS device and shows a novel method for addressing these challenges.

Biography

Peter Egger is currently working as Senior Manager at Bosch in the semiconductor plant. He joined Bosch in 2002 as a Process Engineer supporting cleaning steps for MEMS products. In the past 19 years Peter has worked on various topics in the field of cleaning processes and defect engineering for MEMS processing. In 2007 he took over the lead of the defect engineering group in the MEMS fab. Peter received his Master (Diploma) and Dr. rer. nat. degrees in Physics from Technical University of Munich.

Semiconductor Technology for New Architectures of Implantable Devices

G. Langereis
Research Program Manager
Imec, Eindhoven, Netherlands

Abstract

New electronic implants have a radically different architecture than the electrical stimulators that are currently on the market. We will no longer see a battery powered metal can with separate leads towards the organ of interest. New architectures comprise one or more miniaturized stimulators in the body close to the area of interest, with an external wearable companion for powering and data transmission. With this set-up, future solutions for therapy will comprise closed loop systems that monitor the state of a disease and are able to adjust a therapy accordingly. In modern implementations the computational power is embodied in the companion or a remote computer, but which will have the shape of edge computing in the “smart implant” of the future.

Imec is developing the building blocks for such autonomous therapies that are ready to be implanted in the human body. This can be fully as a smart implant, or partially with a simpler implant assisted by a wearable companion. The first building blocks are energy-efficient and miniature wireless power and data transfer systems for implants up to 13cm into the human body. Neural modulation is seen as a versatile technology to modulate the autonomic nervous system with which many functions can be restored or brought back to a level with an increased quality of live: rheumatoid arthritis, restless bowel syndrome, overactive bladder, etc. In all cases, the building blocks contribute to closed-loop configurations where the continuous daily control of the disease is taken over by an autonomous system.

Biography

Geert Langereis studied Electrical Engineering and Ergonomics at the University of Twente in the Netherlands. He did his Ph.D. at the same university on Lab-on-a-Chip technologies (1999). In the years 1999-2009 he worked at the industrial research laboratories of Philips and NXP on sensors and the associated algorithms for CD/DVD and healthcare applications. In that position, he invented new measurement techniques using silicon technology in combination with data science. From 2009-2020 he did teaching and initiated research for the Technical University of Eindhoven and the school for Applied Sciences on electronics and data science. Currently he is program manager for the Health Research line at imec in the Netherlands where the concept of Autonomous Therapeutics closes the gap between new technologies from universities to the need of healthcare companies.