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TechARENA: MEMS

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Biography
Martina Vogel studied physics at the University of Technology Chemnitz, Germany. She obtained her PhD from the same university in 1994. From 1996 until 2001 she worked as project manager at the GPP Chemnitz mbH. From 2001 until 2006 Martina Vogel was responsible for quality assurance of memory products at ZMD. In 2006 she joined the Center for Microtechnologies of Technische University Chemnitz. Since 2009 she is with Fraunhofer ENAS and works as advisor to the institute management and manager marketing/PR. Since 2015 she works additionally as strategy coordinator of the institute.

New impulses for sensing in automotive: automated driving and electrification in the new infrastructure

R. Dixon
Principal Analyst Sensors
IHS Markit, Technology, Munich, Germany

Abstract
The automotive industry has never been in such a state of flux. Electrification of the engine and automation of the driver function, not to mention connectivity to the world at large, are three of the main factors sculpting the automotive landscape in the next 20 years. Vehicle architectures, systems and components will all be radically affected as a result, and new opportunities will certain result. In this presentation IHS Markit will address the technology for some interesting new applications for sensors, including
- In cabin driver monitoring for L3 applications using TOF sensing
- Technology for LIDAR-based distance sensing applications
- High quality audio experiences using MEMS microphones
- Precision navigation in support of automated driving using MEMS inertial sensors

- Current sensors for electric cars
IHS will also discuss the ramifications for existing sensing applications, some of which will disappear.

Biografie
Richard Dixon, PhD
Principal Analyst, Automotive Sensors
Richard Dixon is Principal Analyst for Automotive Sensors at IHS Markit and author of more than 30 automotive-related consulting and market research studies. He is a world-renowned expert on all aspects of passenger car sensors used in safety, powertrain, infotainment and body applications. His responsibilities comprise the development of databases that forecast market demand for more than 20 types of sensors (MEMS, magnetic, inductive, ceramic...) deployed in more than 100 automotive applications. His most recent research includes mapping the entire sensor requirement by engine and exhaust system at car model level and sensors for future automated driving.
As part of his duties he has supported organizations with custom studies, e.g. future scenarios for car sensors or analyzing the automotive supply chain. Prior to IHS Markit, Richard was a senior analyst at iSuppli with responsibility for MEMS and sensors in automotive and industrial sectors.
Prior to his work as an analyst, Richard Dixon worked as a journalist in the semiconductor industry, and also has five years of experience as a commercialization professional providing support for early stage NASA technologies.
Richard graduated from North Kent University with a degree in materials science and earned a doctorate from Surrey University.

Smart Systems enabling breakthroughs in crucial applications sectors

W. Gessner
Head of Department
VDI/VDE-IT, Future Technologies and Europe,
Berlin, Germany

Abstract
Smart Systems are intelligent technical subsystems with an own and independent functionality. They are (multi-)sensor and actuator based devices capable of describing, diagnosing and qualifying their environment, to make predictions, to reach decisions and to take actions. They provide safe and reliable autonomous operation under all relevant circumstances and are energy autonomous and networked if required.

Smart Systems integrate “cognitive” functions with sensing, actuation, data communication and energy management. The underlying and enabling disciplines include nanoelectronics, micro-electromechanics, magnetism, photonics, chemistry and radiation. What distinguishes a smart system from a system that is purely reactive is the knowledge base which ranges from the set parameters for a feedback loop to embedded databases and algorithms.

New materials, building blocks and integration technologies will have to be capable of meeting future use-case requirements on reliability, robustness, functional safety and security in harsh or not trustworthy environments. This includes the development of materials and technologies for surfaces and interfaces between the individual components in order to guarantee the necessary interconnecting functionality. Time to market will be reduced by new designs, building blocks, testing and self-diagnosis strategies, methods and tools.

Smart Systems will enable technology breakthroughs for solutions in public health, environmental protection, energy efficiency, transportation, safety and security by
• providing intelligent, self-controlled, and adaptable functionalities,
• improving products through optimization of the overall system,
• activating the immense potential of new materials and solutions, e.g. functional materials, cognitive capabilities, micro technologies, nano effects, composite layers, nano sized elements, and
• redefining the interaction between human and technology through HMI solutions.

Biografie
Wolfgang Gessner studied political science, economics and philosophy in Berlin and Urbino/Italy. His professional experience covers national and European R&D policy mechanisms, technology transfer and innovation support instruments. Since 1989 he is with VDI/VDE-IT where he has been primarily dealing with transnational R&D co-operation and innovation support in the field of microsystems technologies. In that context he can rely on both a theoretical background as well as on a more than 25 years practical experience as the manager of technology transfer and innovation support projects. In his position as Head of the Innovation Europe Department he consolidated VDI/VDE-IT’s European activities. In 2004 he initiated the European AAL 169 programme. He also initiated and was chairing the conference series “International Forum on Advanced Microsystems for Automotive Applications” celebrating this year its 21th anniversary. He has been member of the Scientific Advisory Board of TTVenture and was active as an evaluator of R&D projects and programmes. Wolfgang Gessner is currently Head of the Department “Future Technologies and Europe” which focusses

on industrial research policies, particularly on Electrical Mobility and Autonomous Driving. The department is managing some major governmental support programmes in this sector, and is also co-ordinating networks and carrying out studies. It is hosting the Office of EPoSS, the European Technology Platform on Smart Systems Integration, which he is Head of. He is member of the Private Members Board and the Governing Board of the ECSEL Joint Undertaking.

Advanced Mask Aligner Lithography for MEMS and Advanced Packaging

M. Eibelhuber
Deputy Head of Business Developmnet
EV Group, Business Development, St. Florian am Inn, Austria

Abstract
Mask alignment systems are an essential part of the manufacturing lines for MEMS, LEDs and advanced packaging. In particular MEMS devices gain cost and technology advantages which are given by highest throughput, large depth of focus and insensitivity to bowed and warped wafers.

In particular the large depth of focus enables the pattering of high topographies like within a deep etched cavity or over tilted side walls. Additionally this can be also used to efficiently and precisely pattern thick resists up to the range of 100µm.

Recent improvements on the mask aligner equipment provide these and more advantages but with significantly improved throughput of 165 wph, most precise alignment down to 250nm and increased exposure intensity up to 120mW/cm².

Biografie
Martin Eibelhuber is deputy head of business development at EV Group for bonding, lithography and nanofabrication technologies and particularly focusing on compound semiconductors, nanotechnology and engineered substrates.

He holds a PhD (Dr. techn.) in technical physics from the Johannes Kepler University Linz specialized on nanoscience and semiconductor physics. As a university staff member he gained professional experience in photonics, nanofabrication and material characterization.

The Challenge and Opportunity of 200mm/300mm More-Than-Moore (MTM) Technology Transitions

M. Rosa
Head of Marketing, 200mm EPG
Applied Materials, 200mm Equipment Product Group, Santa Clara, United States

Abstract
In recent years, the 200mm wafer fab equipment market has enjoyed somewhat of a renaissance. With the meteoric rise of emerging technologies or the so called More-than-Moore (MTM) class of device technologies, the 200mm and below wafer fabs are seeing increased wafer volume demand and tool utilization rates that are driving the demand for both capacity add and new technology tools alike. While this has proven to be a boon in many respects for equipment OEMs, there are new and existing challenges to be overcome in supporting a growing 200mm market and with that, the increased potential for transition of MTM technologies to 300mm.

From technology segment trends, to supply chain inventory, impact of new vs. used on price and delivery times, device technology transitions, to presenting the value of wafer size migration. This presentation outlines and discusses some of the challenges faced by Applied Materials' 200mm EPG as it navigates the pitfalls and opportunities in rapidly changing legacy semiconductor equipment market place.

Biografie
Mike is currently Head of Marketing for the Equipment Product Group (EPG) within the Applied Global Services division of Applied Materials, Inc., The EPG is composed of New and Refurbished 200mm Semiconductor Equipment, Mask Technology Equipment, and Fab and Environment Solutions (FES) groups. Mike's team within EPG is responsible for identifying key device level technology inflections and translating those into roadmap requirements for the continued development of equipment and processes in support of More-than-Moore (MTM) device technologies, all market sizing and forecasting activities, and finally marketing and communications for the overall group.

Mike brings over 20 years of technology focused product and business development experience in emerging technology segments. Prior to joining Applied Materials Mike held various contributor level and senior leadership positions within the United States and Australia, working for technology focused companies that include Xerox Corp., PARC Inc., Australian Microelectronics Centre (AMC) and National ICT Australia (NICTA). His technical qualifications include B.Eng (Hons) and Ph.D. degrees in Microelectronics Engineering and MEMS Design / Fabrication, respectively. In addition to his technical qualifications, Mike has an MBA with dual majors in Marketing / Business Strategy and a minor in Entrepreneurship. He has authored over 40 journal and conference publications and holds over 25 U.S. patents.

Latest advances in Si DRIE for MEMS Manufacturing – focusing on feature tilt and wafer throughput

J. Carpenter
Etch Product Management Engineer
SPTS Technologies Ltd, Newport, United Kingdom

Abstract
For many years equipment makers have been continuously improving the capability of deep reactive ion etching (DRIE),also known as the Bosch Process, used to etch high aspect ratio features required for silicon MEMS manufacturing. With the demand for smaller, faster, cheaper, and stronger MEMS, there is a constant drive to further improve the silicon etch rate while maintaining a smooth sidewall profile and reducing feature “tilt” characteristics across a wafer.
While all MEMS manufacturers want to optimize silicon etch rate to increase throughput, this is particularly true for device makers who want to etch large, deep cavities. While large cavities may not experience the etch-rate-limiting issues associated with transporting reactive species and reaction products in and out of narrow, high aspect ratio features often found in MEMS structures, generally speaking there is still a trade-off between etch rate and cavity sidewall quality. This presentation will describe how we have developed techniques to significantly increase etch rate in a number of applications, while maintaining sidewall roughness and profiles within the required specifications.
The causes of varying feature tilt across a wafer are very complex, involving hardware and process variables which affect the uniformity of the plasma above the wafer. Control of tilt across the whole wafer is essential to increase yields in volume manufacturing. This presentation will help the audience understand the difference between constant tilt, fine tilt and edge tilt, and the effect of source design and process variables on the plasma, or more precisely the plasma sheath, which determines the ion density and directionality of the ion bombardment during each etch step.
This presentation will show the latest results from the “next generation” of silicon DRIE equipment and describe possible upgrade routes where applicable to existing users.

Biografie
Joanne Carpenter is Etch Product Management Engineer at SPTS, and has over 15 years’ experience in the semiconductor and electronics manufacturing industries. Prior to her current role, Joanne has worked for European Semiconductor Manufacturers Ltd (ESM) and ZBD displays Ltd. Joanne joined Surface Technology Systems (STS) in 2007 as an Etch Process Engineer. When STS and Aviza merged in 2009 to form SPTS, she joined the etch samples

division as a Senior Etch Engineer, specialising in development of innovative etch process solutions and supporting SPTS customers on critical advanced packaging technologies in China, Taiwan and North America. In 2016 Joanne joined SPTS's Etch Product Management team.

MEMS Sensors for automotive safety

M. OSAJDA
Business Development Director - MEMS
NXP, Toulouse, France

Abstract
Mobility enhances quality of life, but can come at a steep cost. The World Health Organization (WHO) counts 1.2 million people killed on world roads every year. WHO forecasts annual road fatalities to rise to 1.9 million by 2020. Road deaths are currently the number one cause of death for young people worldwide. The economic cost to developing countries is estimated at close to $100 billion per year. Making vehicles safer is not only a moral imperative but an economic one as well.
Electronic Systems Save Lives
While the momentum is currently on developing highly automated driving solutions to further reduce road fatalities by taking the human factor out of the equation, there will be situations where an accident might not be completely avoidable (human error, unpredictable mother nature events for example). As such, passive safety system as we know them today on our existing vehicles will continue to play a major role in protecting the driver and the occupants, may be even a more important role if the driver and the occupants are not necessarily paying attention to the road conditions in automated driving situations.
This presentation will specifically highlight the latest development in terms of MEMS Automotive sensors for passive safety and highlight what makes an automotive MEMS sensors truly different from a consumer/IOT Sensors. What are the requirements in terms of performances, packaging, testing, reliability, functional safety and product longevity and how those challenges are addressed by NXP. Two product examples will be presented: Latest generation of Airbag sensors and Tire pressure monitoring sensor needed to comply with regulation but also for automated driving.

Biografie
Marc Osajda is Business Development Director for Automotive MEMS sensors at NXP Semiconductors, Toulouse, France

Prior to this position, M. Osajda was the Director of Freescale Pressure Sensor business unit, with a specific focus on Automotive pressure sensors such as Tire Pressure Monitoring sensors

Prior to this position, M. Osajda was in charge of Freescale Global Automotive Strategy. Responsible for market analysis and strategy formulation.

M. Osajda joined Motorola's European semiconductor business in 1992 as a design engineer. From 1995 to 2004, M. Osajda was involved with the European Automotive industry, respectively as application engineer for sensors, marketing engineer for sensors and program manager for automotive products

Marc Osajda holds a Master Degree in mechanics and electronics from the French “Ecole Nationale Superieure d’Arts et Métiers” (ENSAM).