Advancements in Wireless Tech

The Pivotal Role of Uniformity of Electrolytic Deposition Processes to Improve the Reliability of Advanced Packaging

R. Schmidt
R&D Manager Semiconductor
Atotech, Berlin, Germany

Abstract
Heterogeneous integration is considered as the key technology to create large, complex System in Package (SiP) assemblies of separately manufactured, smaller components. Proper control of the uniformity of each process step constitutes one of the main challenges during integration of the different components into a higher-level assembly. In this context, processes that create thick layers by electrochemical deposition are especially susceptible to variations across the substrate. Such processes include copper pillar and bump as well as tin-silver applications. Insufficient coplanarity of electrolytic copper would result in significant reliability issues or evolution of stress in the package. Upcoming hybrid bump designs with features of different dimensions pose additional challenges to the electrolytic copper and tin-silver processes. Purposeful adjustment of differences between the heights of pillars of different diameters may be required after the copper process step in order to obtain the best uniformity for the complete stack with tin-silver on top. In addition to coplanarity, the electrolytic process should allow modification shape of the individual pillar or bump. In this context, a versatile copper electrodeposition process will be discussed that allows adjustment to a broad variety of uniformity parameters and combinations thereof. In combination with suitable tin-silver deposition processes, this process is expected to significantly improve the reliability of copper pillars and bumps for advanced packaging applications.

Biography
For the past 10 years Ralf Schmidt has held various roles related to R&D at Atotech, wherein he focused, amongst others, on the development of various metal deposition processes. He is currently R&D Manager Semiconductor and responsible for all R&D projects, which are related to Semiconductor and Advanced Packaging topics.
Ralf is author of numerous publications and patents in this field and committee member of the Advanced Packaging conference of Semicon Europe as well as the 3D & Systems Summit.

Engineered Substrates and Materials for 5G

C. Roda Neve
R&D Program Manager
SOITEC, Hasselt, Belgium

Abstract
information coming soon

Biography
Cesar Roda Neve was born in Madrid, Spain, in 1975. He received the Msc. Engineer degree from the ICAI Universidad Pontificia de Comillas, Madrid, Spain, in 2000. In 2012, he received the Ph.D. degree in engineering sciences from the Université catholique de Louvain (UCL), Belgium. From 2004 to 2006, he was with the Electronics Department of the University Carlos III of Madrid, Spain, where he worked on ROF links and optoelectronic devices. From 2006 to 2012, he joined the Microwave Laboratory at the Université catholique de Louvain (UCL), Belgium, where he worked on the characterization and application of Si-based substrates for RF integration, in particular the use of HR-Si, HRSOI, and trap-rich HR-SOI substrates, non-linearities and parasitic effects. From 2013 to 2016, he was with the 3D and Optical Technology group at IMEC, where he worked on signal integrity, power delivery networks and RF modeling with special attention to 3D stacking and packaging. From 2016 to 2020, he worked at M3Systems Belgium as project manager for GPS, interferences and satellite related projects. In 2021 he joined SOITEC Belgium as R&D Program Manager. His research interest are new applications for SOI substrates for RF, with focus in 5G and 6G communications.

Opportunities and challenges of high-throughput 3D metrology equipment for semiconductor process control

H. Sadeghian
CEO
Nearfield Instruments, Rotterdam, Netherlands

Abstract
In the semiconductor industry, Moore's law comes with increasing and complex demands and the need for advanced process control metrology. Traditional metrologies like OCD or CD-SEM lose sensitivity due to diminishing interaction volume. A metrology technique that thrives in this regime is Atomic Force Microscopy (AFM).
AFM is a technique currently used in process and integration development because it can provide reference-level local imaging and metrology. Unique strength over competing metrology techniques includes the potential for undistorted, local high-resolution information. Two factors are currently limiting deployment of AFM tools for inline process control: 1) ability to fully resolve deep, narrow structures and 2) throughput compatible with other metrologies currently deployed in High Volume Manufacturing (HVM). Here, we discuss the advantages of a multi-head AFM system with miniaturized high-speed AFMs working in parallel. In addition, we extend traditional AFM techniques to selective imaging and metrology of subsurface 3D structures and show a path to enabling Overlay metrology through opaque hard mask layers.

Biography
Dr. Hamed Sadeghian

Co-Founder, President and CEO of Nearfield Instruments

Hamed Sadeghian received his PhD (Cum Laude) in 2010 from Delft University of Technology. Four years later he received an MBA degree from the Vlerick Business School in Belgium. He is the founder (2001) of Jahesh Poulad Co., a manufacturer of mechanical equipment.

Hamed worked as a system architect and leaded a team of thirty researchers in nano-optomechatronics instrumentation at TNO in Delft from 2011 to 2018. In 2016 he co-founded Nearfield Instruments and is currently president & chief technology officer at this scale-up that recently sold its first metrology instrument to a high-end chip manufacturer.

Hamed Sadeghian is a part time associate Professor at the Technical University of Eindhoven. He holds more than 70 patents, and published over 100 peer-reviewed technical papers. He is currently also a principal scientist and Kruyt member of TNO.

Driving Down Cost of Ownership – New High Throughput "Cluster" Evaporation Production Tools for Wireless Applications

F. Kurdzesau
Process Engineer, Semiconductor Business Unit
Evatec, Trübbach, Switzerland

Abstract
Evaporation remains a powerful, flexible production technology for metallization and "lift off" process in wireless communication applications. However, manual wafer loading and the long conditioning, pumping/venting time characteristic of classical evaporation tools can make it difficult to achieve the increasingly demanding throughput and cost of ownership targets for emerging high-volume production businesses. Evatec's innovative cluster design raises the performance bar allowing manufacturers to overcome that challenge. It combines automatic atmosphere loading with fast pumping/venting in loadlock, where a single robot for substrate handling serving up to four process chambers each equipped with its own loadlock module. The presentation will demonstrate the operation of a first BAK cluster evaporation production tool, discuss its performance, throughput and relative cost of ownership.

Biography
Fiodar Kurdzesau is Dipl. Engineer-Physicist (Gomel State University, 1999) with a PhD in Physics (EPFL Lausanne, 2009) and Technical Science (Belarussian National Academy of Sciences, 2004). Since completing his studies he has worked as a scientist within various academic Institutions (ETH Zurich, EPFL Lausanne, PSI Villigen) and within industry including Oerlikon Solar 2009-2012. He joining Evatec in 2019. His fields of interests include physics, electronics and material science with special focus on thin film deposition technology for microelectronics.