Bernard Pelissier, J Nanomed Nanotechnol 2018, Volume 9
DOI: 10.4172/2157-7439-C10-093

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Quasi in situ advanced characterizations for materials upfront studies and process development in microelectronic-the IMPACT 300mm project and platform: merging academic research and industrial applications

The high complexity of the actual microelectronics chip's production chain leads to an increasing number of process steps. In addition, due both to the extreme thinness and chemical nature of the large variety of materials actually processed, surface's exposure to air born molecular contamination (AMC) becomes a critical issue. In parallel to this problematic of surface control between process steps, preserving the surface's physico-chemical state is also a key point for material's advanced characterization studies. In this scope, the so called quasi in situ analyses, based on keeping high quality static vacuum inside a specific carrier allow to keep surface integrity during transfer between tools [1]. This is one of the key feature of our specific IMPACT 300mm characterization platform that we developed at lab these last years. The overall idea of this innovative setup is to merge the benefits of this quasi insitu transfer concept with advanced best in class characterization tool.Thus, the purpose of such a platform is dual:- For all processes dealing with materials sensitive to the atmosphere, the preservation of the vacuum chain between different process tools and characterization chambers allows a fine understanding and development of industrial processes [2,3,4,5].- The advanced and upfront nature of the characterization techniques implemented on the platform allows extensive academic studies [6,7,8].After a description of the project's concept and platform structure (see image below), the presentation will highlight a few key applications and results related to both purposes above. Moreover, studies and results about transfer's performances with regards to AMC will be presented too.

Recent Publications

1. P E Raynal, V Loup, et al. (2018) Wet and Siconi® cleaning sequences for SiGe p-type MOS channels. Microelectronic Engineering 187–188(2018):84–89.
2. R Vallat, R Gassilloud, et al. (2017) Selective deposition of Ta2O5 by adding plasma etching super-cycles in PEALD steps. J. Vac. Sci. Technol. A 35(2017):01B104.
3. L Fauquier, B Pelissier, et al. (2017) Depth profiling investigation by pARXPS and MEIS of advanced transistor technology gate stack. Microelectronic Engineering 169:24–28.
4. Gerald Ndong, Angel Lizana, Enric Garcia-Caurel, et al. (2016) Use of optical spacers to enhance IR Mueller ellipsometry sensitivity. Applied Optics 55(12):3323–3332.
5. F Piallat, V Beugin, et al. (2014) Interface and plasma damage analysis of PEALD TaCN deposited on HfO2 by angle resolved XPS and C-V for advanced CMOS. Applied Surface Science 303:388–392.

Biography

Bernard Pelissier after an experience in industrial R&D, integrated CNRS (French National Center for Scientific Research) in 1994. His research activities are mainly focused on material science and surface characterisation. He first worked on massive crystalline growth and MOCVD deposition and then integrated LTM (Laboratoire des Technologies de la Microélectronique) in 2001 as XPS surface characterisation manager. His research interest focused on materials fundamentals studies for process development and contamination studies in clean room. He has been involved in several European collaborative projects in surface characterisation.Since 2005 he is interested in quasi insitu physico-chemical characterisation using vacuum transfer. He actually manages the IMPACT Equipex project "A 300mm quasi insitu advanced characterisation platform combining pARXPS, Raman and ellipsometry using vacuum transfer", dedicated to studies at the frontier between process development studies and upfront research.

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