

Webinar

The potential and challenges of two-dimensional materials for More-than-Moore applications

Abstract:

Graphene and other two-dimensional materials (2DM) have garnered significant attention in science and engineering due to their potential applications in electronics, photonics, and sensing. Despite over 15 years of extensive research and proven laboratory-scale performance, industrial adoption of 2DM-based technologies remains limited. The primary reasons include the dominance of mature silicon technology and the current technological challenges associated with 2DMs, such as defect management, dielectric deposition, doping, etching, and electrical contacts.

The integration of 2DMs with silicon CMOS at the back-end-of-line (BEOL) or front-end-of-line (FEOL) presents an opportunity to expand silicon's capabilities while addressing 2DMs' maturity issues. This co-integration enables applications beyond traditional silicon, particularly in optoelectronics, sensors, and flexible electronics. Current research highlights projects such as graphene-based biosensors for point-of-care diagnostics, integrated photonics, gas sensors, and advanced flexible transparent electrodes.

International collaborations at the University of Granada are driving innovations in biosensors, gas detection, and photonics. These efforts aim to enable high-performance, cost-effective, and scalable solutions for diverse industries. While challenges remain, the promise of 2DMs in enabling "More-than-Moore" applications underscores their transformative potential in next-generation technologies.

Bio:

Prof. Francisco Gamiz graduated with honors in Physics (National Award, Spanish Ministry of Education) in 1991 and obtained his Ph.D. (Extraordinary Award) in 1994 at the University of Granada (UGR). His research began with Monte Carlo simulations of semiconductor devices, leading to international collaborations with institutions like the TJ Watson Research Center of IBM (1999), TU Wien (2000, 2002) and Glasgow University (2006) or Grenoble INP (2008).



Prof. Gamiz has played a pivotal role in several European research projects. He coordinated the EUROSIO and EUROSIO+ projects under EU FP6 and FP7, which established the EUROSIO conference series on SOI technology, today EUROSIO-ULIS conference. As a member of the Governing Board of the SINANO Institute, he has contributed to advancing European Nanoelectronics. Since 2010, he has secured over €10M in funding from the Spanish Government, establishing the Laboratory of Nanoelectronics, Graphene, and 2D Materials at CITIC-UGR.

He has collaborated with leading organizations, including SOITEC, Imec, CEA-Leti, STMicroelectronics, and GlobalFoundries, and participated in major EU industrial projects such as REACHING-22, Place-2B, WAYTOGOFASST and REMINDER. Currently, he is Head of the +QCHIP University Chair under Spanish Chip Law, and advisor for several EU Marie Curie grants. Prof. Gamiz is also a member of the Science Academy of Granada, driving innovation in semiconductor and nanoelectronics research.