Robert Wallace

Professor and Erik Jonsson Distinguished Chair,

Department of Materials Science & Engineering,

Jonsson School of Engineering and Computer Science

The University of Texas at Dallas

https://sites.google.com/view/robert-m-wallace/home

Robert M. Wallace received his B.S. in Physics and Applied Mathematics in 1982 at the University of Pittsburgh where he also earned his M.S. (1984) and Ph.D. (1988) in Physics, under Prof. W. J. Choyke. From 1988 to 1990, he was a postdoctoral research associate in the Department of Chemistry at the Pittsburgh Surface Science Center under the late Prof. John T. Yates, Jr.

In 1990, he joined Texas Instruments Central Research Laboratories as a Member of Technical Staff (MTS) in the Materials Characterization Branch of the Materials Science Laboratory and was elected as a Senior MTS in 1996. Dr. Wallace was then appointed in 1997 to manage the Advanced Technology branch in TI's R&D which focused on advanced device concepts and the associated material integration issues. In 2003, he joined the faculty in the Erik Jonsson School of Engineering and Computer Science at the University of Texas at Dallas (UTD) as a Professor of Electrical Engineering and Physics. He is a founding member of the Materials Science and Engineering program at UTD. Dr. Wallace also has appointments in the Departments of Electrical Engineering, Mechanical Engineering, and Physics.

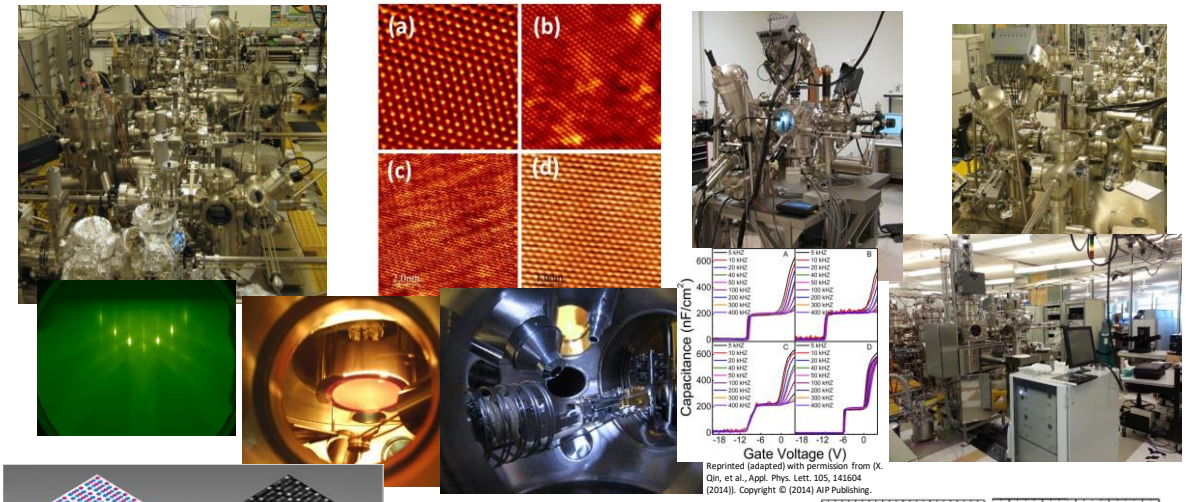
Research in the Wallace group focuses on the study of surfaces and interfaces, particularly with applications to electronic materials and the resultant devices fabricated from them. Current interests include materials systems leading to concepts that may enable further scaling of integrated circuit technology and beyond CMOS-based logic. These include the study of the surfaces and interfaces of compound semiconductor systems including arsenides (e.g. InGaAs), nitrides (e.g. GaN), phosphides (e.g. InP), as well as antimondies (e.g. GaSb), and most recently 2D materials such as graphene and transition metal dichalcogenides. He has authored or co-authored over 400 publications in peer reviewed journals and proceedings with over 38000 (52000) citations according to Scopus (Google Scholar). His Hirsch index is 79 (98) according to Scopus (Google Scholar). Since 2018-2021, Wallace has been identified by Clarivate Analytics as a "Highly Cited Researcher" for multiple highly cited papers ranking in the top 1% indicating substantial influence across several fields during the last decade. Of the global population of researchers, Highly Cited Researchers are 1 in 1000. See: https://hcr.clarivate.com/ In 2023, he was appointed as a US Fulbright Scholar to Ireland.

Dr. Wallace is also an inventor on 48 US and 27 international patents/applications, and a co-inventor of the Hf-based high-k gate dielectric materials now used by the semiconductor industry for advanced high-performance logic in microprocessors. He was named Fellow of the AVS in 2007 and an IEEE Fellow in 2009 for his contributions to the field of high-k dielectrics in integrated circuits.

Physical Characterization of Advanced Device Materials

Robert M. Wallace
Professor and Erik Jonsson Distinguished Chair
Eric Jonsson School of Engineering and Computer Science
The University of Texas at Dallas, Richardson, Texas, 75080 USA

A variety of materials are now under investigation for advanced device concepts and applications which entail essentially atomic length scales. In addition to establishing materials properties in the context of device physics and potential performance, an understanding of the integration constraints and the impact on the materials interfaces must also be addressed, as interfaces with contacts and dielectrics dominate device characteristics. This talk will introduce the surface/interface physical characterization aspects of such advanced device materials, such as high-mobility and 2D materials, complex oxides, and nitrides, as well as the role of impurities and defects in these materials. The physics of the characterization/metrology techniques will be discussed, and examples of correlating such physical and chemical materials characterization to device behavior will also be presented.



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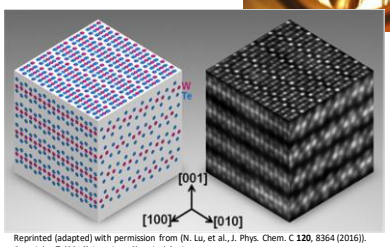

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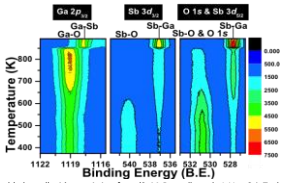

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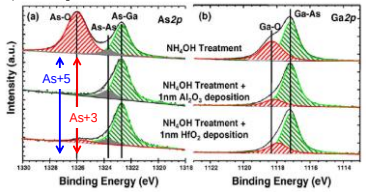

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