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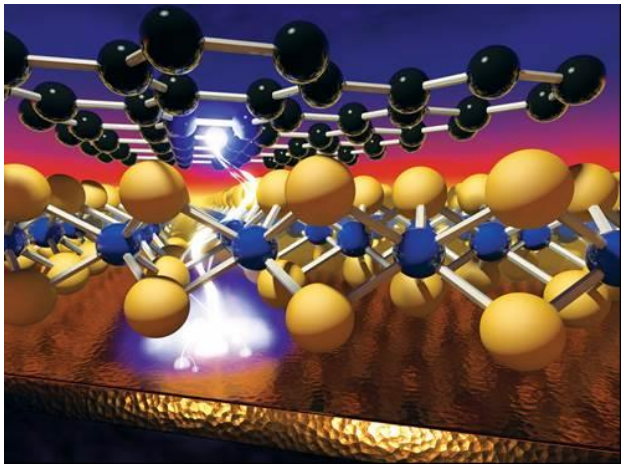
Novel Applications of 2D Materials from Electronics to Health



This talk will present our latest research adventures on 2D nanomaterials towards greater scientific understanding and advanced engineering applications. In particular, the talk will highlight our work on flexible electronics, zero-power devices, single-atom monolayer memory, non-volatile RF/5G/6G switches, and wearable tattoo sensors for mobile health. Non-volatile memory devices based on 2D materials are an application of defects and is a rapidly advancing field with rich physics that can be attributed to metal adsorption into vacancies. The memory devices can be used for neuromorphic computing and operate as switches up to 500GHz. Likewise, from a practical point, electronic tattoos based on graphene have ushered a new material platform that has highly desirable practical attributes including optical transparency, mechanical imperceptibility, and is the thinnest conductive electrode sensor that can be integrated on skin for physiological measurements including blood pressure monitoring with Class A performance. Much of these research achievements have been published in leading journals.

References:

[1] D. Kireev, …, and D. Akinwande, "Continuous Monitoring of Arterial Blood Pressure Via Graphene Tattoos," *Nature Nanotechnology,* 2022.

[2] M. Lanza, et al., "Memristive technologies for data storage, computation, encryption, and radio-frequency communication," Science, 2022.

[3] M. Kim, …, and D. Akinwande, "Monolayer molybdenum disulfide switches for 6G communication systems," Nature Electronics, 2022.

[4] S. M. Hus, …, and D. Akinwande, "Observation of single-defect memristor in an MoS2 atomic sheet," *Nature Nano.,* 2020.

[5] Akinwande, et al., " Graphene and 2D Materials for Silicon Technology," *Nature,* 2019.

Deji Akinwande is a professor and holds the Temple Foundation Endowed Professorship No. 1 at The University of Texas at Austin Department of Electrical and Computer Engineering.

He received the PhD degree in Electrical Engineering from Stanford University in 2009, where he conducted research on the material science, device physics, and circuit applications of carbon nanotubes and graphene. His Master's research in Applied Physics at Case Western Reserve University pioneered the design and development of near-field microwave probe tips for nondestructive imaging and studies of materials.

His research focuses on 2D materials and nanotechnology, pioneering device innovations from lab towards applications. Prof. Akinwande has been honored with the 2018 Fulbright Specialist Award, 2017 Bessel-Humboldt Research Award, the U.S Presidential PECASE award by President Obama, the inaugural Gordon Moore Inventor Fellow award, the inaugural IEEE Nano Geim and Novoselov Graphene Prize, the IEEE "Early Career Award" in Nanotechnology, the NSF CAREER award, several DoD Young Investigator awards, the 3M Nontenured Faculty Award, and was a past recipient of fellowships from the Kilby/TI, Ford Foundation, Alfred P. Sloan Foundation, and Stanford DARE Initiative. His recent results on silicene have been featured by nature news, Time and Forbes magazines and was selected among the top 2015 science stories by Discover magazine. He invented 2D memory, also known as atomristors. His work on flexible 2D electronics was highlighted among the "best of 2012" by the nanotechweb news portal and has been featured on MIT's technology review and other technical media outlets. He is a distinguished lecturer of the IEEE Electron Device Society, an Editor for Nature NPJ 2D Materials and Applications, and on the editorial boards for Science, ACS Nano, and Nano letters journals. He is the co-Chair of the Gordon Research Conference on 2D electronics, and was a past Chair of the 2018/2019 Device Research Conference (DRC), and the Committee Chair of Nano-devices for 2018 IEEE IEDM Conference. He co-authored a textbook on carbon nanotubes and graphene device physics by Cambridge University Press, 2011, and was recently a finalist for the Regents' Outstanding Teaching Award, the highest teaching award from the University of Texas System. He is a Fellow of the American Physical Society (APS).