“Adventures with Flexible 2D Materials”

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ABSTRACT: 2D nanomaterials are ideally suited for nano-optoelectronics owing to their combined troika of properties involving high mobility and electrostatic control, high thermal conductivity, mechanical strength, optical transparency, and large surface to volume ratio all of which derive from their atomically thin profile. We discuss the progress on graphene which has been the most studied of the 2D materials and offers the highest mobility. Despite the lack of a bandgap, high-frequency electronics and circuits have been demonstrated, and growth on 300m wafers achieved. In addition, new results on TMDs and phosphorene indicate they might be very attractive for digital and analog RF functions due to its tunable direct bandgap and high mobility beyond TMDs. Furthermore, we report on the first realization of transistors made from silicene, the 2D silicon equivalent of graphene. Finally, commercialization of graphene in mobile electronic systems is described.

Bio: Dr. Deji Akinwande received the PhD degree in Electrical Engineering from Stanford University in 2009, where he conducted research on the synthesis, 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.

He is an Associate Professor with the University of Texas at Austin. Prof. Akinwande has been honored with the 2016 Presidential PECASE award, the inaugural IEEE Nano Geim and Novoselov Graphene Prize, the IEEE “Early Career Award” in Nanotechnology, the NSF CAREER award, the Army and DTRA Young Investigator awards, the 3M Nontenured Faculty Award, and was a past recipient of fellowships from the Ford Foundation, Alfred P. Sloan Foundation, and Stanford DARE Initiative. He recently co-authored a textbook on carbon nanotubes and graphene device physics by Cambridge University Press, 2011. His recent results on silicene have been featured online by nature news, Time magazine among other media outlets. His work on flexible 2D electronics was selected as 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 and an Editor for the IEEE Electron Device Letters.