Title: *2D Crystals for Smart Life*

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Abstract— The experimental demonstration of *graphene* in 2004, a truly one-atom thick layer of carbon atoms, has opened up a window to the two-dimensional (2D) world of materials. This has subsequently triggered a surge of research activities on various 2D crystals including single layers of hexagonal-boron nitride (*h*-BN), several dichalcogenides (such as MoS_2 and WSe_2), and complex oxides. Atomic scale thicknesses (few Å/layer) of 2D semiconducting crystals and their controllable precise band gaps as a function of number of layers also enable the scaling of electronic devices without inducing performance variations. Moreover, seamless planar synthesis and stacking of various 2D crystals can be exploited to build novel lateral and vertical heterostructures, respectively. This talk will highlight and discuss the prospects of such 2D crystals for designing ultra-low power, low-loss, and ultra-energy-efficient active and passive devices targeted for designing next-generation *green electronics* needed to support the emerging paradigm of *Internet of Things*. More specifically, this talk will examine the genesis of the power dissipation challenge in conventional MOSFETs, and provide an overview of the recently demonstrated 2D-channel tunnel-FET from my group that overcomes this challenge and is a fundamentally different transistor employing several innovations. This talk will also bring forward some applications uniquely enabled by 2D crystals, including sensors and flexible high-frequency electronics for improving quality of life, and discuss related challenges and opportunities.