

Mechanical Engineering Department Seminar

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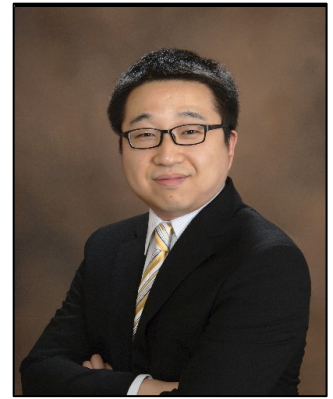
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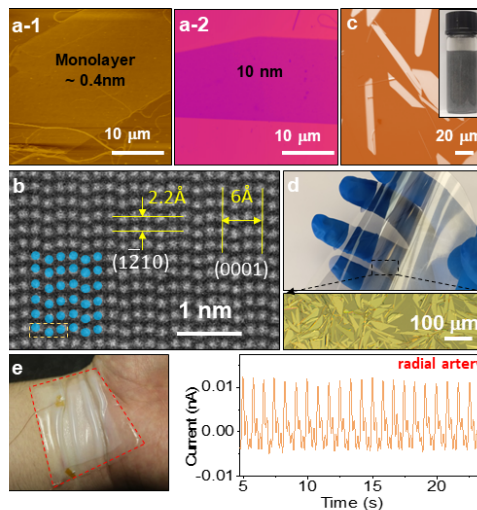
Large-Area Solution-Manufactured Air-Stable 2D Material for High-Performance Electronics and Smart Sensors

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The reliable production of two-dimensional (2D) crystals is essential for exploring new science and implementing novel technologies in the 2D limit. However, ongoing efforts are limited by the vague potential in scaling-up, restrictions on growth substrates and conditions, small sizes and/or instability of synthesized materials. In this talk, I will discuss our recent progress in the fabrication of large-area, high-quality 2D material by a substrate-free solution process. The crystals exhibit process-tunable thicknesses from a monolayer, bi-layer, tri-layer to tens of nanometers, and lateral sizes ~ 100 μm . Our prototypical 2D transistor device, which is air-stable, shows an excellent all-around figure of merits compared to existing 2D materials. We further carry out the first experimental exploration of piezotronic effect in such solution-grown 2D material and systematically investigate the piezotronic transport properties. The coupling between the piezoelectric and semiconductor properties in such material system enables the design and implementation of novel electronic devices and smart sensors that can interact with the mechanical stimuli. Our approach has the potential to produce stable, high-quality, ultrathin semiconductors with a good control of composition, structure, and dimensions for applications in electronics, optoelectronics, and energy devices.



Bio: Dr. Wenzhuo Wu is an Assistant Professor in the School of Industrial Engineering at Purdue University. He was previously a postdoctoral fellow in School of Materials Science and Engineering at Georgia Institute of Technology. He received his B.S. in Electronic Information Science and Technology in 2005 from the University of Science and Technology of China (USTC), Hefei and his M.E. in Electrical and Computer Engineering from the National University of Singapore (NUS) in 2008. Dr. Wu received his Ph.D. from Georgia Institute of Technology in Materials Science and Engineering in 2013. Dr. Wu's research interests include synthesis, manufacturing, and integration of nanomaterials/devices for applications in energy, electronics, optoelectronics, sensing, and self-powered micro/nano-systems. He was a recipient of the Oak Ridge Associated Universities (ORAU) Ralph E. Powe Junior Faculty Enhancement Award in 2016.