

Atomically Thin Circuits on Silicon

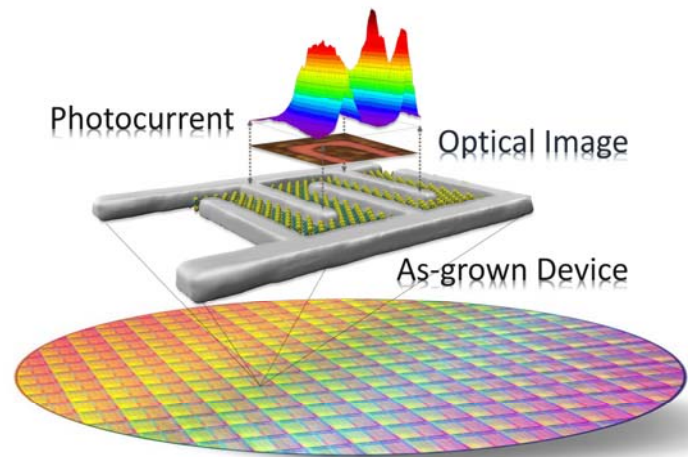
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Overview

As Moore's Law predicted, impending limitations in traditional CMOS technology led to a need for new innovation. The potential of two-dimensional (2D) materials, such as graphene, to both enhance existing technologies as well as provide new functionalities stimulated an explosion of research into these materials. In addition to characteristics such as extraordinarily high mobilities, semiconducting and superconducting behavior, ferromagnetism, and excellent thermal properties, many of these materials exhibit optical control of spin and valley degrees of freedom which may provide novel material-enabled functions in emerging areas such as spintronics or valleytronics. Despite this enormous potential, the inability to process material into working devices with any scalability is the largest impediment to capitalizing on the industrial promise of 2D materials. This technology has the potential to provide a scalable, front-end compatible, chemical vapor deposition (CVD) process to produce complex, conformal, as-grown, self-contacted 2D materials-based devices.

Benefits

- Simple and scalable process
- Compatible with a variety of 2D materials (MoS_2 , MoSe_2 , WS_2 , WSe_2 , etc.)
- Complex geometries
- Heterostructured (multi-material) devices



Commercial Application

- CMOS front end compatible production of 2D materials-based devices
- Direct on-chip integration of sensors (optical, chemical, etc.)
- Flexible electronics



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About the Inventor

Eric Stinaff is an Associate Professor in the Department of Physics and Astronomy at Ohio University in Athens, OH. He obtained his BA from St. Olaf College in 1993, and Ph.D. in 2002 from Iowa State University. From 2003-2006 he was a National Research Council Postdoctoral Fellow at the Naval Research Laboratory in Washington, DC, where his work on coherently coupled quantum dots was recognized with the prestigious Alan Berman Research Publication Award from the Department of the Navy in 2006 and a Postdoctoral Publication Award from the National Research Council in 2007. He joined Ohio University in 2006. He is the author of more than 30 papers and 3 book chapters with over a thousand total citations. His current research has expanded to include colloidal nanocrystals, quantum rings, two-dimensional materials, and composite systems of nanostructures.



Photo by Lydia Deakin

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