



Mechanical Engineering Seminar Series

Nano-modular Processing of Electronics

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Tuesday, October 5, 2021

Room 3150 DOW

4:00 p.m.

This seminar will also be streamed live at the following link

[ME Seminar Zoom link](#) (QR Code below)

Password 413824



Abstract

This talk will introduce and describe our efforts to enable the ‘nano-modular processing’ of electronics. Nano-modular processing factors the manufacturing of nanoelectronic circuitry into distinct device fabrication and interconnection steps, with discrete, interchangeable nano-modular devices serving as the main process intermediates. Modularization at the device level promises an unprecedented combination of performance, cost, and function, and, as a result, electronics that are natively heterogeneous, on-demand manufacturable, physically reconfigurable, and/or dispersible. Nano-modular device fabrication leverages three bottom-up processes: (i) vapor-liquid-solid semiconductor nanowire growth, (ii) a new nanoscale polymer masking process, and (iii) area-selective atomic layer deposition. Our approach yields single-crystalline, high mobility nanowires with nanoscale coaxial dielectric and metal thin films self-aligned to the internal dopant profile. In parallel, we are developing the Geode process to increase manufacturing throughput by

several orders-of-magnitude. This scale-up is made possible by an unconventional substrate– the interior surface of hollow silica microcapsule powders – on which nanowire growth and subsequent processing occurs. Collaborative efforts are also enabling nanowire property characterization in a high- throughput, non-contact fashion and high-resolution interconnection of nano-modular devices to form functional circuitry.

Bio

Dr. Filler is an Associate Professor in the School of Chemical and Biomolecular Engineering and, by courtesy, in the School Materials Science and Engineering at the Georgia Institute of Technology. His research program lies at the intersection of chemical engineering and materials science, focusing on the synthesis, understanding, and deployment of nanoscale materials for applications in electronics, photonics, and energy conversion. Dr. Filler has been recognized for his research and teaching with the National Science Foundation CAREER Award, Georgia Tech Sigma Xi Young Faculty Award, and as a Camille and Henry Dreyfus Foundation Environmental Chemistry Mentor.

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