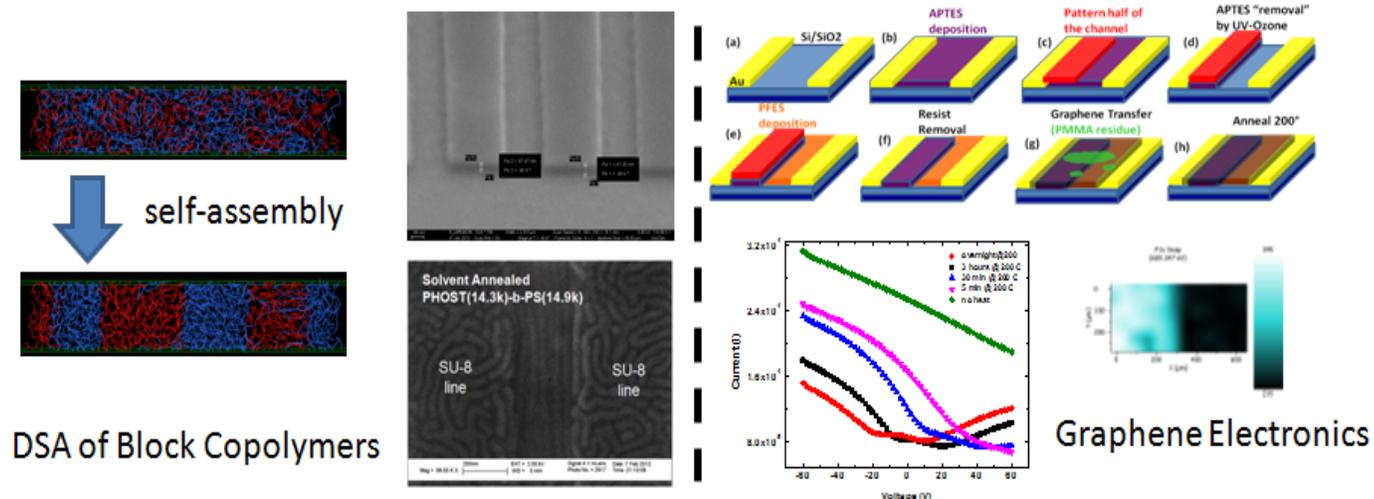


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Organic Nanotechnology: Enabling Future Nanoelectronics

Abstract

Although many people think of microelectronics technology (e.g. integrated circuits) as a world dominated by inorganic materials (e.g. silicon, copper), organic materials have played a critical role in the field since virtually its inception in a variety of roles ranging from the photoresist materials used to pattern and manufacture device layers to dielectric insulators used in printed circuit boards and ICs. As electronics technology continues to advance, organic materials are poised to be an even more critical component in the manufacture of future devices. This talk will highlight two areas of current research in our group where we are designing novel organic molecules, polymers, and processes for producing and enabling future electronics. The first area of interest in our group that will be discussed is the development of materials and processes for high resolution patterning. For example, we are exploring the directed self-assembly of block copolymers as a means to extend the capabilities of current lithographic exposure tools to produce sub-20 nm pitch patterns. This work involves the design of both new block copolymers with sufficiently high c parameters to achieve these dimensions and the corresponding materials and processes that can be used to guide the self-assembly of the materials into the desired patterns. The second area that will be discussed is the development of novel materials and processes for the fabrication and integration of graphene into electronics devices. Graphene is a promising organic material for electronics due to its intrinsically high mobility (i.e. pristine graphene can have mobilities on the order of $200,000 \text{ cm}^2/\text{Vs}$). However, development of methods for synthesizing or growing graphene and integrating it in useful ways into devices is a substantial challenge. In this talk, a discussion of our approaches to producing graphene films and structures that do not rely on high temperature SiC processing will be discussed.



Bio

Professor Henderson received his B.S. in Chemical Engineering with Highest Honors from the Georgia Institute of Technology in 1994. He subsequently received his M.S. in Engineering and Ph.D. in Chemical Engineering from The University of Texas at Austin in 1996 and 1998, respectively. After spending a short time with Motorola in their Advanced Products Research and Development Laboratory, he returned to Georgia Tech where he has spent the last 13 years conducting research in a variety of areas related to polymers, organic materials, thin films, lithography and stereolithography, and microelectronics. Professor Henderson has published more than 170 papers in these areas and has been granted more than 10 patents for his work. He is an active member of a number of professional societies including SPIE, the American Institute of Chemical Engineers (AIChE), the American Chemical Society (ACS), the American Vacuum Society (AVS), the Electrochemical Society (ECS), and the Materials Research Society (MRS) and is currently the Vice-Chair for the Materials Engineering and Science Division of AIChE. Professor Henderson has received a number of awards for his teaching and research including a CAREER Award from the National Science Foundation and he was elected to be a Fellow of SPIE in 2010.