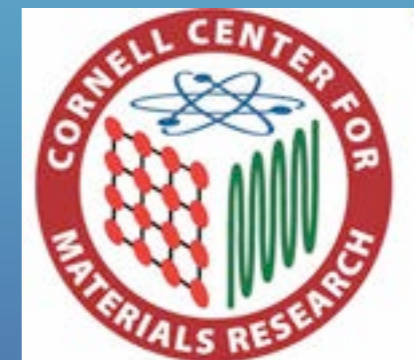


Howard University

Partnership for Reduced Dimensional Materials (PRDM)

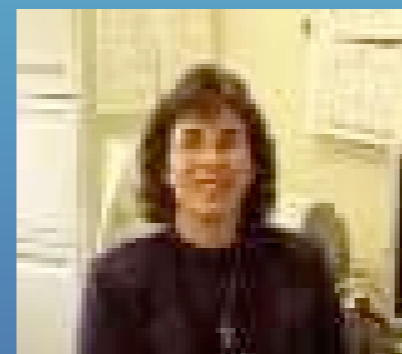


Gary L Harris, PI
Michael G. Spencer, Co-PI





**Gary L Harris, Joshua B. Halpern, Nefertiti Jackson,
Kimani A. Stancil, Tito Huber, Jason Matthews,
Silvina Gatica, John Harkless, Kim L. Jones**
Howard University



**Scott Sinex, Scott D. Johnson, Paul Sabila,
Christine C. Sorensen**
PGCC & Gallaudet



**Melissa A. Hines,
Michael G. Spencer,
Nevijinder Singhota**
Cornell University

Cornell-CCMR

Howard



Bi Topological
Insulators
Huber-HU
Johnson-PGCC

Precursor
Synthesis
Matthews-HU
Sabila-GU

1-2D Materials
Harris-HU
Halpern-HU
Stancil-HU

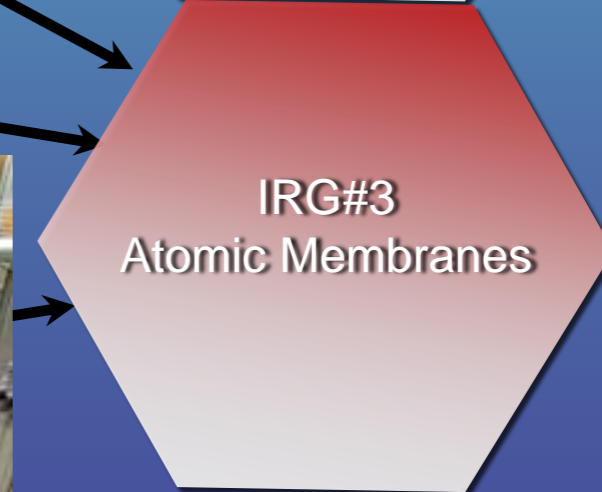
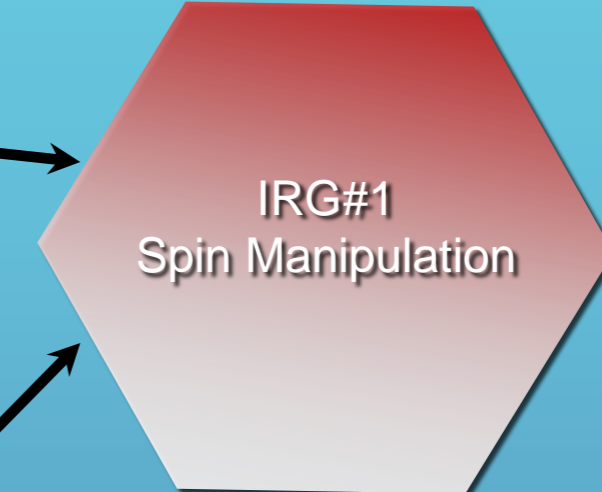
MC Theory
GaticaHU
Harkless-HU
Sorensen-GU



IRG#1
Spin Manipulation

IRG#2
Controlling Complex
Electronic Materials

IRG#3
Atomic Membranes



Howard-Cornell-PGCC-GU Activities

Weekly Webinars->35 lectures

Summer Program- REU program (2)

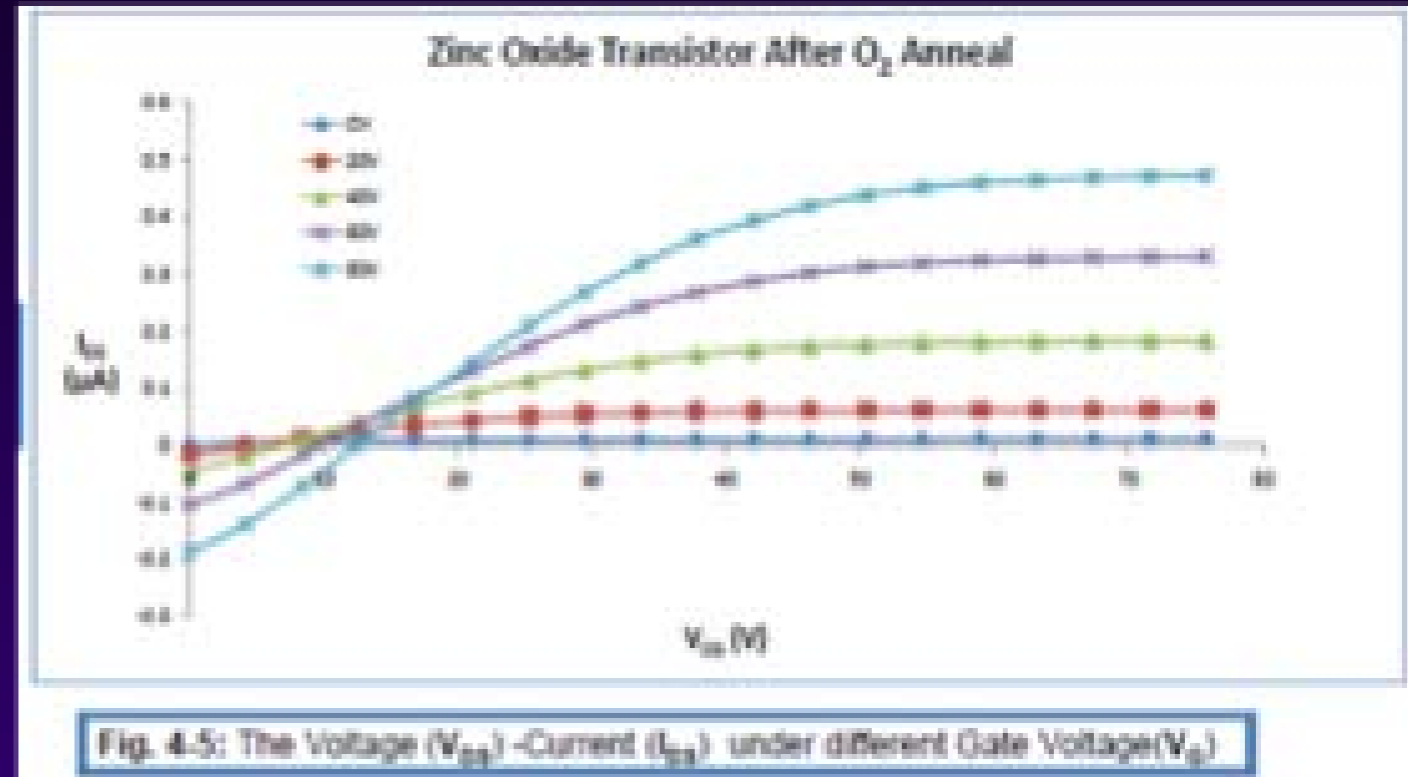
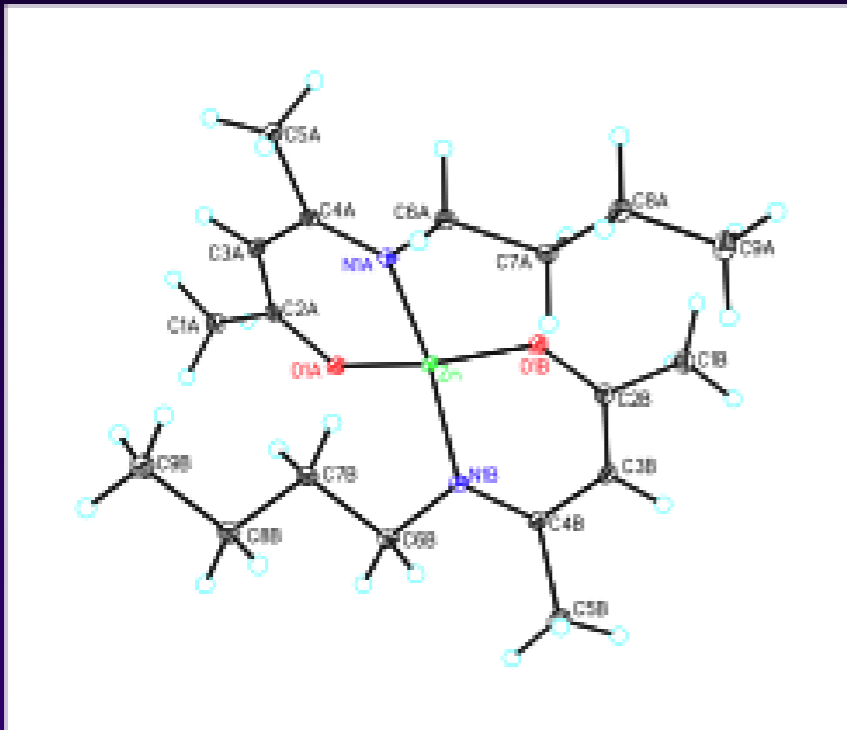
10 Summer Research (UG) students at Howard

Howard Student admitted to Ph.D. program at
Cornell

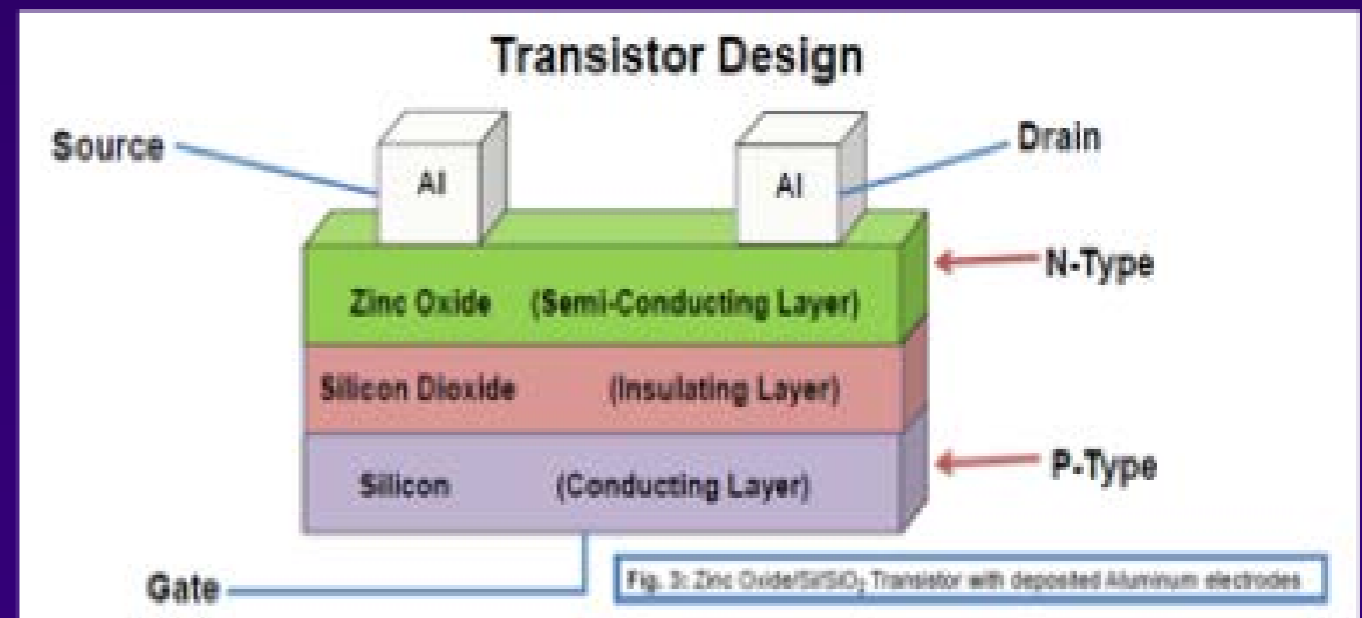
Summer and yearly visits by HU/PGCC/GU faculty
to Cornell

Michael Spencer visiting Professor @ HU

Synthesis and Evaluation of Novel ZnO MOCVD Precursors



Chemistry: Matthews Research Group: K. O. Johnson Ph.D.
Jason S. Matthews, PhD



CVD of Large area graphene

Cu or Ni evaporation + annealing
on SiO₂ deposited on Si

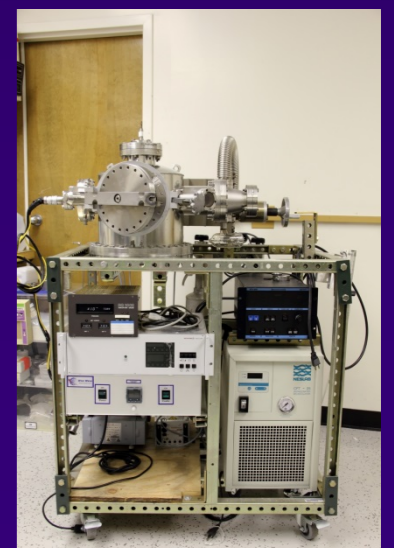
Methane CVD of graphene

Transfer on graphene layer using
PMMA/photoresist

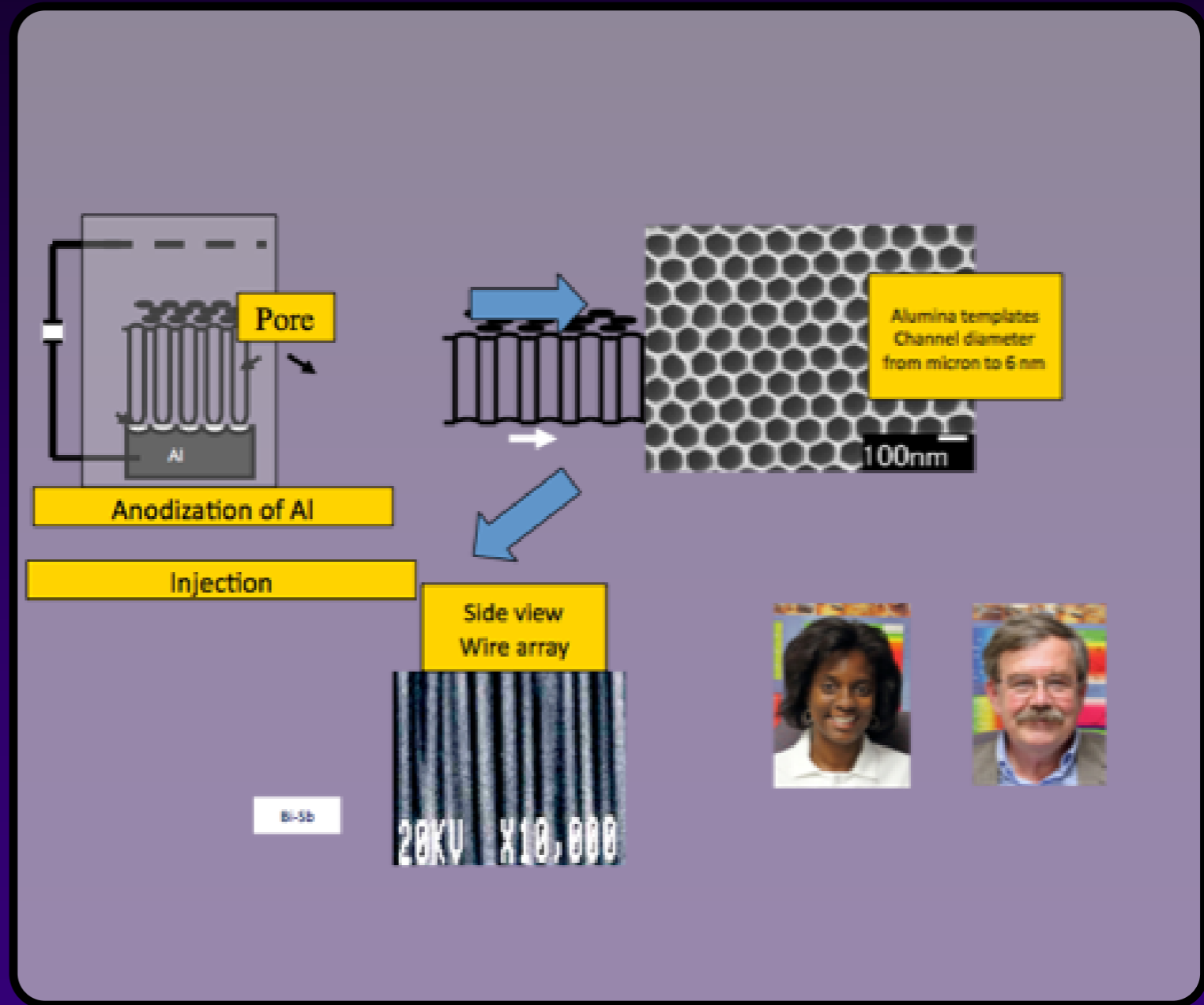
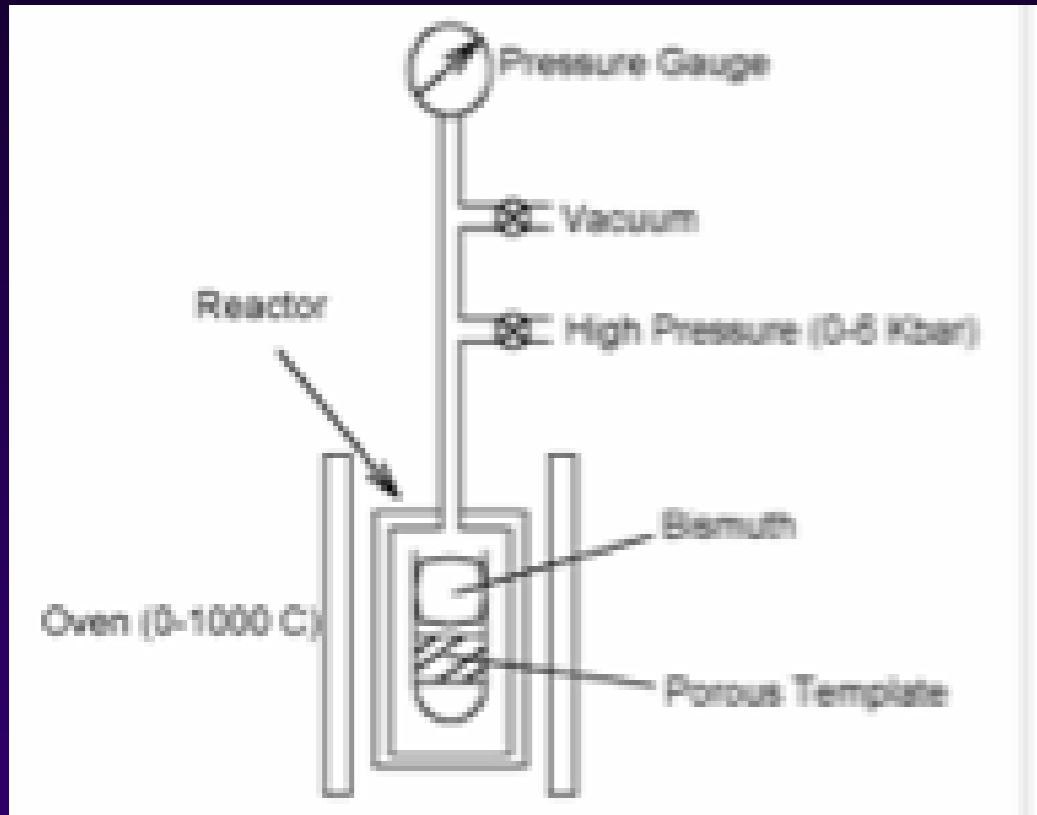
graphene release with HCL+H₂O

Also growth of graphene by Hot
filament CVD and SiC surface
conversion

M.G. Spencer (Cornell U.), J Halpern (Howard),
G.L. Harris (Howard)



Fabrication of Bi Sb Nanowires for Thermoelectric Applications



T. Brower-Thomas, T. Huber
(Howard), S Johnson & S. Sinex
(Prince George's Community
College)

Graphene on 3C-SiC by Sublimation

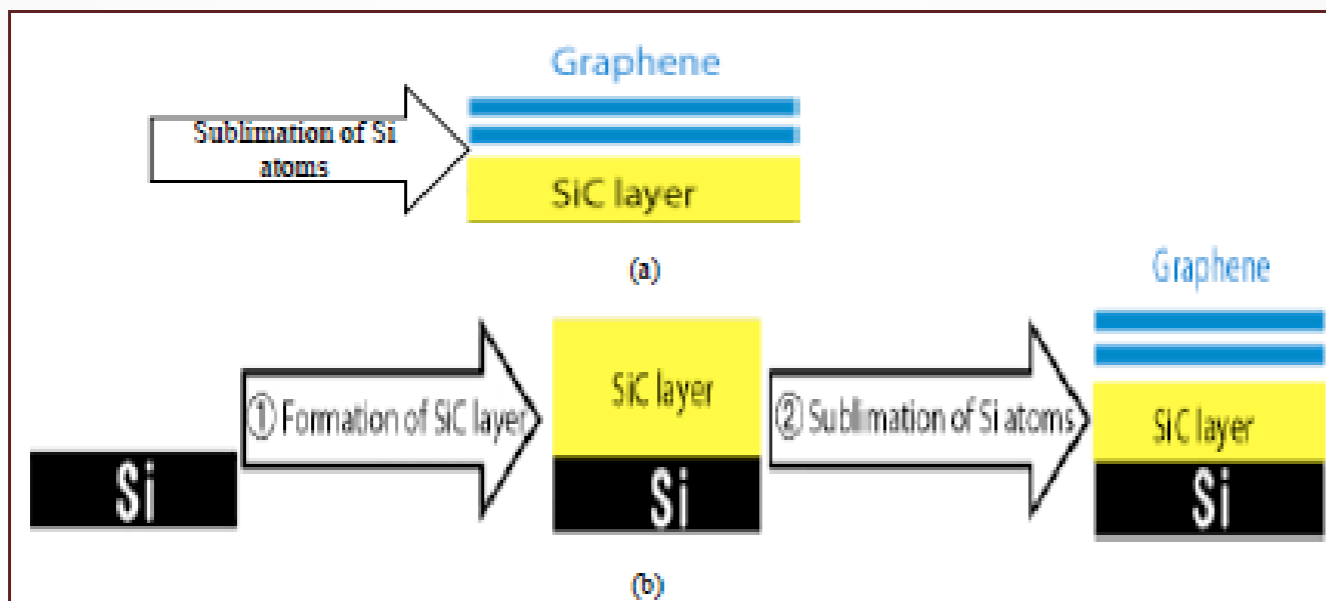
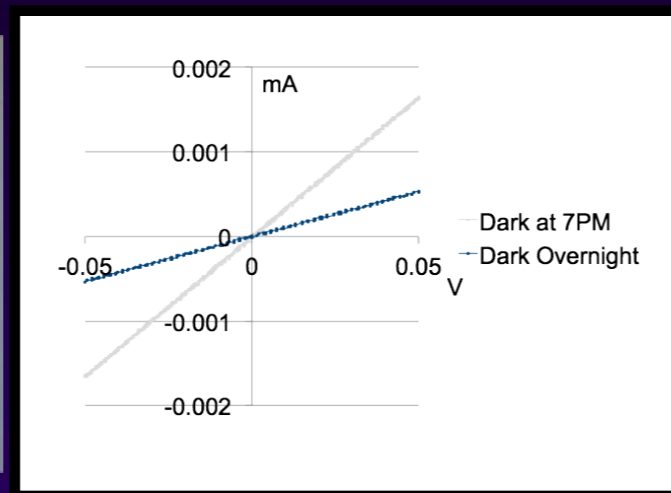
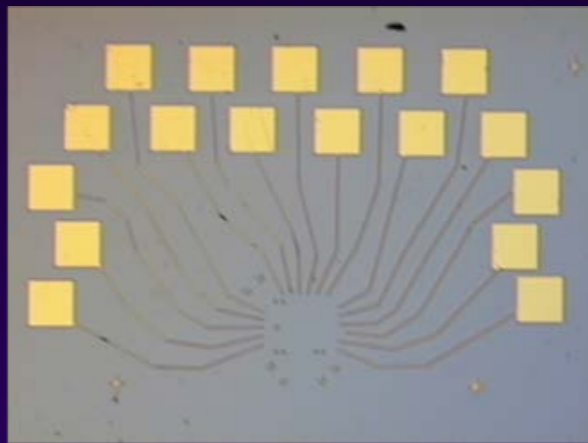


Fig.4: Fabrication process- (a) Sublimation of Si atoms from SiC substrate,(b) Sublimation of Si atoms from SiC layer grown on Si substrate²

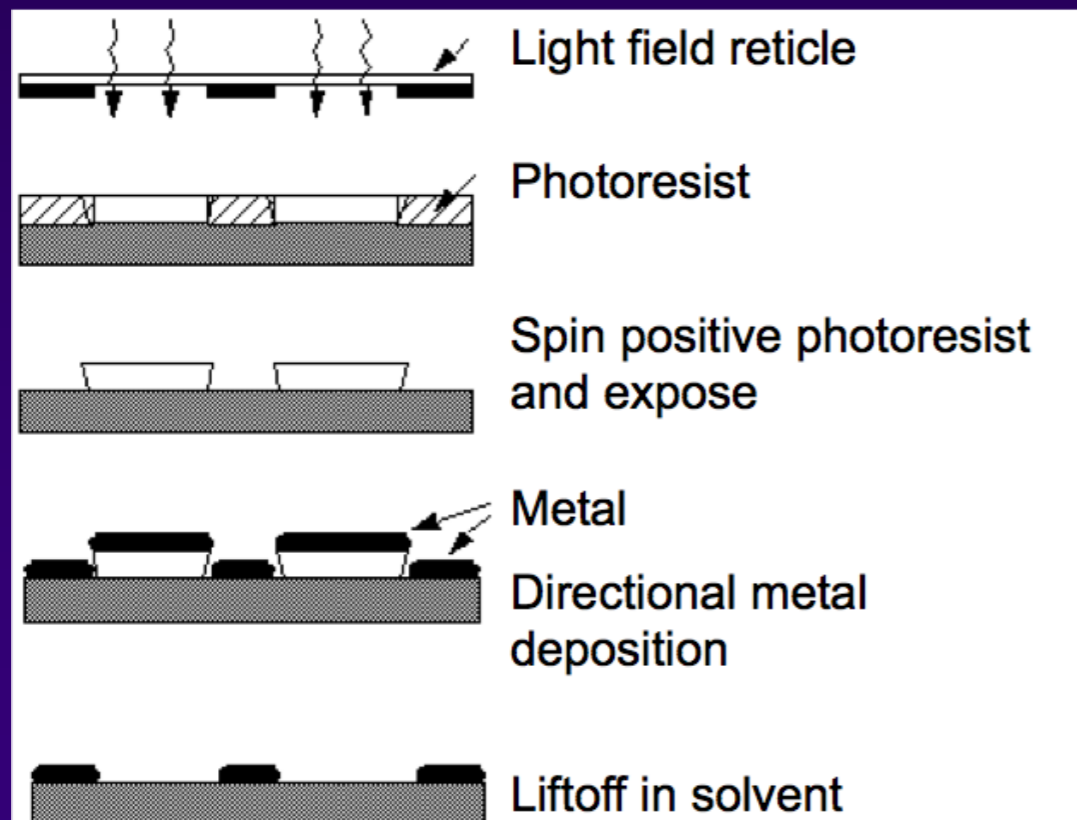
1. Form monolayers and multilayers of graphene on 3C-SiC
2. Characterize the properties of the grown material
3. Fabrication of high-G (150 G's) accelerators

M.G. Spencer(Cornell U.),C. Taylor(Howard), G.L.Harris (Howard)

Fabrication of GaN nanowire FETs



The nanowire device displayed ohmic contact between the wire and the deposited metal



Persistent photocurrent in a GaN nanowire

S. Reum, J Halpern(Howard), G.L.Harris

NNIN Research Vision

NNIN actively seeks to serve the nanofabrication needs of outside users from universities, government, and industry

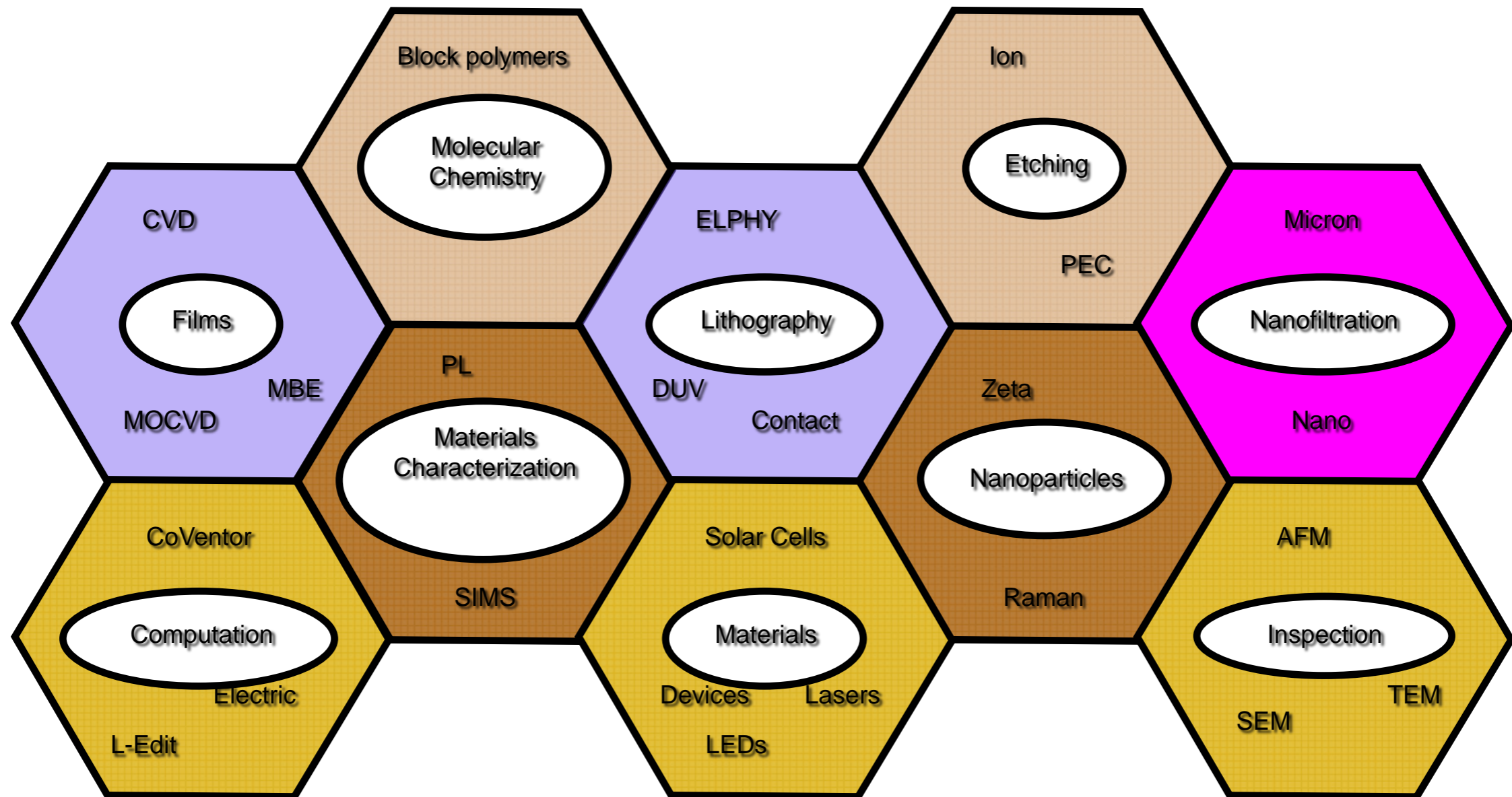
Enabling rapid advancements in science and engineering at the nano-scale by efficient support of national research

“open labs”

Training and “state of the art equipment”



HNF-Enabling Technology



IRB Building



43,400 sq./ft.

10,000 sq./ft. for HNF users

4000 sq./ft. for
Characterization/Core
Space

\$70M investment

\$10M in additional equipment

Howard Innovation Lab

IP Protection and Licensing

Industrial Partners

Start-up Creation

Close coupling with educational/research
missions

The *NanoExpress* is mobile science theme park exhibiting some of the latest science and technology at the nano dimension in a variety of disciplines.

