MASH Mission & Scope

MASH will support the CHIPS and Science Act to enhance America's strength in semiconductors and microelectronics and promote economic development.

The goal of MASH is to create the world's largest nanofabrication, packaging, and characterization facility by linking and enhancing the facilities in the region. The MASH "distributed" network of facilities will support technology transition to manufacturing and offer redundancy of resources and immediate access to a huge amount of technical expertise in semiconductors.

MASH will focus on helping the semiconductor industry to transition materials into systems, which is a critical industrial need of many emerging applications such as advanced communications, non-volatile memory, More than Moore devices, Industrial Internet of Things, artificial intelligence, edge computing, wireless communications, quantum devices, environmental sustainability, and materials and substrates.

MASH activities will center around three cross-cutting areas: Si-adjacent technologies, advanced packaging, and virtualization of semiconductor processes.

MASH will develop skills-based educational and workforce development plans to provide companies with an agile system to meet staffing requirements, and at the same time, enhance racial and socioeconomic diversity.

MASH will be a hub for regional and national activities to promote professional education and training, educate the public on semiconductors and microelectronics, share and coordinate materials standards, identify funding opportunities, and build networks and technology road maps.

MISSION & SCOPE

MASH Mid-Atlantic SEMICONDUCTOR HUB

UNIVERSITY OF DELAWARE

The University of Delaware has been a pioneer in materials research and development since the founding of its renowned Center for Composite Materials in 1974. Complementing this legacy, UD has established premier infrastructure and expertise for the innovation of semiconductor materials and devices, including facilities for nanofabrication, epitaxial materials growth, characterization, and electron microscopy.

UDNF: nanofabrication facility

UNIVERSITY OF DELAWARE NANOFABRICATION FACILITY (UDNF)

The University of Delaware Nanofabrication Facility enables faculty, academic and corporate partners to create devices smaller than a human hair, supporting scientific advances in fields ranging from medical diagnostics to solar energy harvesting. Located in the 194,000-square-foot Harker Interdisciplinary Science and Engineering (ISE) Laboratory, UDNF has expert staff, state-of-the-art technology and world-class capabilities in lithography, deposition, dry etching, thermal processing, characterization, and device packaging. Areas of excellence include photonic devices and nanostructured solid-state materials with unique optoelectronic and magnetic functionality.

CONTACT: Iulian Codreanu, codreanu@udel.edu

The 8,500-square-foot clean room in the UD Nanofabrication Facility is divided into Class 100 and Class 1000 spaces.

AMCL: characterization lab

ADVANCED MATERIALS CHARACTERIZATION LABORATORY (AMCL)

Housed in the research wing of Harker Interdisciplinary Science and Engineering (ISE) Laboratory, UD's Advanced Materials Characterization Laboratory offers an array of sophisticated instrumentation, including an elite X-ray absorption spectroscopy (XAS) system offering synchrotron-like performance and 3D X-ray imaging microscopes that perform nondestructive, nano-computed tomography, similar to a hospital CT scan, with applications in areas ranging from additive manufacturing to pharmaceutical packaging. The AMCL is operated as a user facility and is staffed by expert personnel who train users through a robust series of short courses.

CONTACT: Gerald Poirier, gpoirier@udel.edu

MGF: materials growth

MATERIALS GROWTH FACILITY (MGF)

UD's Materials Growth Facility unlocks new functionalities in semiconductor materials. The MGF provides the infrastructure and staff support necessary for faculty, academic, and corporate partners to undertake competitive research, offering III-V and topological insulator growth of epitaxial semiconductor films, magnetic and precious metal sputtering, and electron beam evaporation of high temperature metals — all interconnected under ultra-high vacuum. MGF researchers study a diverse range of materials including metal/semiconductor nanocomposites, topological insulators, dilute bismuthides, hyperbolic metamaterials, magnetic tunnel junction heterostructures, heavy metal/ferromagnetic metal ultrafast spintronics, and quantum dot arrays.

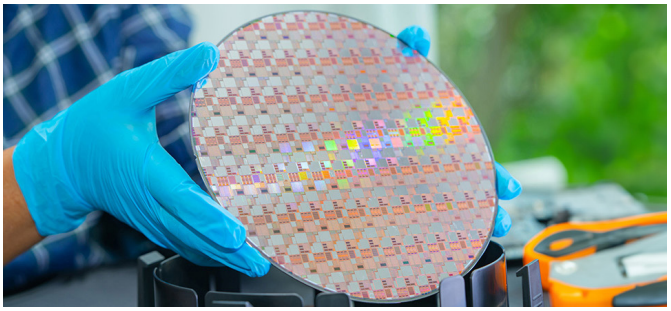
CONTACT: Joshua Zide, zide@udel.edu

FACILITIES

UD-CCM: composite materials

CENTER FOR COMPOSITE MATERIALS (UD-CCM)
Since its founding in 1974, the University of Delaware's Center for Composite Materials has been nationally recognized as a center of excellence by the National Science Foundation and the U.S. Department of Defense for interdisciplinary research, education and technology transfer in the areas of materials and synthesis, multifunctional materials, processing science, mechanics and design, sensing and control, and software. Utilizing 52,000 square feet of state-of-the-art facilities, UD-CCM develops models and simulations in a "virtual manufacturing" environment for process optimization and tool design, leading to improved quality, affordability, and innovative new composite manufacturing processes. The center also develops online sensors and devices for monitoring composites manufacturing to end-of-life and validates control schemes using simulations and manufacturing work cells.

CONTACT: Srikanth Pilla, spilla@udel.edu



Silicon wafers like the one shown can be used to create computer chips, circuits and other devices.

KeckCAMM: microscopy

W. M. KECK CENTER FOR ADVANCED MICROSCOPY AND MICROANALYSIS CORE (KECKCAMM)
KeckCAMM is a user facility for the structural and chemical characterization of materials at scales ranging from micron to angstrom. Located in the research wing of UD's Harker Interdisciplinary Science and Engineering (ISE) Laboratory, it provides researchers with access to field emission transmission electron microscopes, scanning electron microscopes, and scanning probe microscopes — some with remote access and control to facilitate research collaborations or classroom teaching. Expert laboratory staff provide extensive training opportunities.

CONTACT: Yong Zhao, yongzhao@udel.edu

DiCoS: computation

CENTER FOR DATA INTENSIVE AND COMPUTATIONAL SCIENCE (DICOS)
High performance computing capabilities are available at UD through the Center for Data Intensive and Computational Science, including the Delaware Advanced Research Workforce and Innovation Network (DARWIN), which has 105 compute nodes with a total of 6,672 cores, 22 GPUs, 100 terabytes of memory, and 1.2 petabytes of disk storage. DARWIN is part of the ACCESS advanced computing and data resource supported by the National Science Foundation.

CONTACT: Rudi Eigenmann, eigenman@udel.edu

KEY MASH CONTACTS

	NAME	TITLE	DETAILS
PennState	**Daniel Lopez**	Liang Professor of Electrical Engineering Director, Nanofabrication Lab, Materials Research Institute	dlopez@psu.edu (814) 867-1575
	Osama Awadelkarim	UNESCO Chair Professor Director, Center for Nanotechnology Education and Utilization	ooa1@psu.edu (814) 863-1773
	Shannon Munro	Vice President for Workforce Development Pennsylvania College of Technology	smm20@pct.edu (570) 320-2400
	Mark Threeton	Professor of Education, Associate Director of PPDC	mdt177@psu.edu (814) 863-5361
	Priya Baboo	Senior Director of Corporate and Industry Engagement, College of Engineering	pzb104@psu.edu (814) 863-9142
Penn	**Mark Allen**	Scientific Director, Singh Center for Nanotechnology	mallen@seas.upenn.edu (215) 898-5901
	Gerald Lopez	Director, Business Development Singh Center for Nanotechnology	lopezg@seas.upenn.edu (215) 573-4041
NYU	**Nina Gray**	Assistant Vice Provost for Research	graya01@nyu.edu (212) 998-2304
	Kurt Becker	Vice Dean for Research, Innovation and Entrepreneurship	kurt.becker@nyu.edu (646) 997-3608
University of Delaware	**Jamie Philips**	Chair, Department of Electrical and Computer Engineering	jphilli@udel.edu (302) 831-2128

KEY MASH CONTACTS

MASH Mid-Atlantic SEMICONDUCTOR HUB

	NAME	TITLE	DETAILS
PRINCETON UNIVERSITY	**Alex Norman**	Executive Director Princeton Materials Institute	an8759@princeton.edu (609) 258-6855
	Barry Rand	Associate Professor of Electrical and Computer Engineering	brand@princeton.edu (609) 258-7692
	Richard Register	Director, Materials Institute	register@princeton.edu (609) 258-4692
BOSTON UNIVERSITY	**David Bishop**	Head of the Division of Materials Science & Engineering	djb1@bu.edu (617) 353-8899
	Alice White	Professor and Chair, Mechanical Engineering	aew1@bu.edu (617) 353-2814
COLUMBIA UNIVERSITY	**James Hone**	Chair, Department of Mechanical Engineering	jh2228@columbia.edu (212) 854-3304
	Samar Kaukab	Director of Strategic Research Development	sk4578@columbia.edu (212) 854-2996
UNIVERSITY OF MARYLAND	**Pamela Abshire**	Professor, Electrical and Computer Engineering	pabshire@umd.edu (301) 405-6629
	Ankur Srivastava	Professor & Director Institute for Systems Research	ankurs@umd.edu (301) 405-0434
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851	**Pawan Tyagi**	Professor of Mechanical Engineering & Director of ME Graduate Program	ptyagi@udc.edu (202) 274-6601

MARKETING COMMUNICATIONS

	NAME	TITLE	DETAILS
PennState	**Jennifer McCann**	Marketing Director, Materials Research Institute MASH Communications Manager	jmm96@psu.edu (814) 867-4173
	Kimberly Brue	Assistant Vice President Research Communications	kimberly.brue@psu.edu (814) 865-6042
Penn	**Lee Ozier**	Program Coordinator Singh Center for Nanotechnology	ozierd@seas.upenn.edu
NYU	**Joseph Tirella**	Senior Director of Executive Communications	jvt8915@nyu.edu (212) 998-6796
University of Delaware	**Tracey Bryant**	Senior Director for Research Communications	tbryant@udel.edu (302) 831-8185
Princeton University	**Steven Schultz**	Director of Engineering Communications	sschultz@princeton.edu (609) 258-3617
Boston University	**Rachel Lapal Cavallario**	Associate VP, Public Relations	rlapal@bu.edu (617) 353-7628
Columbia University	**Michele Hoos**	Executive Director of Communications, Engineering	mfh2107@columbia.edu (212) 305-0820
University of Maryland	**Institute for Systems Research**	Resources for the Media	mediainfo@umd.edu (301) 405-6602
University of the District of Columbia 1851	**Leeaan Hall**	Vice President for Marketing & Communications	leeann.hall@udc.edu (202) 934-5047
	Andrea Williams	Assistant Vice President for Marketing & Communications	andrea.williams@udc.edu (202) 274-5177

MASH

Mid-Atlantic SEMICONDUCTOR

HUB

WANT TO LEARN MORE?

JOIN OUR NEWSLETTER

KEEP INFORMED
GET INVOLVED

www.mash-semiconductors.org

CHIPSAct@psu.edu

MASH

Mid-Atlantic SEMICONDUCTOR

HUB

Partnering for a Strong American Semiconductor Future