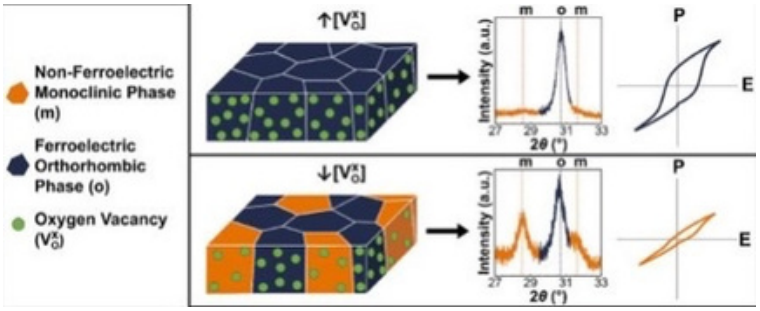
NOVEMBER 2022

CONNECTIONS

LATEST NEWS AND UPDATES FROM
SEMICONDUCTOR RESEARCH CORPORATION

UVA materials science engineers work on new material for computer chips

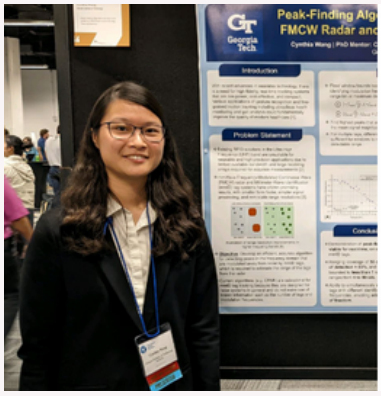


Members of Prof. **Jon Ihlefeld**'s multifunctional thin film group are doing their part to explore ways to make computing less of an "energy hog." Within SRC's NMP program, they are investigating ferroelectrics that may allow the industry to co-locate computation and memory on a single chip. **Shelby Fields**, who earned a Ph.D. in materials science engineering from UVA this year and now works at HRL Laboratories, published a landmark study to explain how and why hafnium oxide forms into its useful, ferroelectric phase based on the nature of the top electrode. "Now we understand why the top layer is such an important consideration. Down the line, people who want to integrate computing and memory on a single chip will have to think about all the processing steps more carefully," Fields said.

CHIPS Act Implementation Requires Strong Focus on 'Advanced Packaging,' Industry Leaders Say

Leaders of top semiconductor, microelectronic, IC-Substrate, PCB, EMS, and OSAT companies along with the U.S. government and the European Commission gathered in Washington, D.C. on October 11th-12th to discuss "the next big thing" in CHIPS Act implementation: expanding "advanced packaging" capacities and capabilities to go along with an increased production of semiconductor chips. As part of the event, IPC issued a new report, based on a survey of nearly 100 industry leaders in semiconductors and related fields, showing strong industry support for greatly increased public and private investments in advanced packaging efforts. "Advanced packaging is a key element in defining the next generation of semiconductor innovation," said IPC Chief Technologist **Matt Kelly**.

Spotlight on JUMP URI Winner: Cynthia Wang



Cynthia Wang placed first in the Joint University Microelectronics Program (JUMP) Undergraduate Research Initiative (URI) Poster Competition at TECHCON 2022. Wang, a computer engineering major at GA Tech, received top overall recognition for her research project, "Peak Finding Algorithm for Real-Time mmWave FMCW Radar and mmID Tag Tracking Systems." In addition to her research, Wang has interned at Google and more recently joined NVIDIA as an architect intern, working on performance analysis for functional models of GPU architectures. Excellent job, Cynthia, and thank you to all undergraduate and graduate students who participated this year!

Semiconductor Research Corporation

CRISP PI Professor Appointed Dir. of Computer Engineering Program at UVA

Professor **Mircea Stan** is the Virginia Microelectronics Consortium Professor in ECE at the University of Virginia. Prof. Stan is teaching and doing research in the areas of high-performance low-power VLSI, temperature-aware circuits and architecture, embedded systems, spintronics, and nanoelectronics. Congratulations, Mircea!

Best Paper Runner-Up At MICRO 2022 to CRISP PI Jason Cong, Tony Nowatzki, & Students

Congratulations to Prof. **Jason Cong**, his colleague **Tony Nowatzki**, and their students for winning Best Paper Runner-Up Award at MICRO 2022 for: "*OverGen: Improving FPGA Usability through Domain-specific Overlay Generation*." The work was led co-authors **Sihao Liu**, a 4th year PhD, and **Jian Weng**, who is on the academic job market this year. Six other UCLA students contributed, including both PhDs: **Dylan Kupsh, Atefeh Sohrabizadeh, Zhengrong Wang, Licheng Guo**, as well as MS, undergraduate, and interns.

R U Tagging @SRCORG on Twitter?

SRC Announces 2022 Sustainability Benchmarks; Future Goals

World Sustainability Day was celebrated on Oct. 26. We used the day as an opportunity to reflect on our current practices, policies, and progress throughout the past year, and published a thorough compilation of those efforts.

Environmental Sustainability in the Semiconductor Industry: The Need for Science and Innovation

Brooke Tvermoes, IBM

Nov. 1, 4pm - 5pm ET

REGISTER NOW

CRISP Student M. Ceylan Mogul Won Best Poster Presentation

Photo Credit: Todd Younkin. M. Ceylan Mogul presenting at TECHCON 2022

The University of Virginia School of Engineering hosted a "Welcome Back" event in which graduate students showcased their work. **Muhammed Ceylan Mogul**, an SRC Scholar in the JUMP CRISP Center, won the 1st Best Poster Presentation Award with "Achieving Everlasting Flash Memory by Preventing Permanent Cell Wear-out With Timely Recovery in Circadian Rhythm."

Mark Tehranipoor wins the 2022 IEEE CS TTTC Bob Madge Innovation Award

Mark Tehranipoor from the Univ. of Florida has received the 2022 IEEE CS TTTC Bob Madge Innovation Award at the International Test Conference (ITC). This award recognized his pioneering, innovative work in hardware security along with strong industrial collaborations that drive the entire semiconductor ecosystem to be more secure and trustworthy. Well done, Mark!

SRC Member Companies & JUMP PIs Among Speakers at PIM2

A Processing In Memory (PIM) tutorial and workshop on Oct 1st at the IEEE/ACM International Symposium on Microarchitecture had over 100 people registered. The agenda covered PIM history, recent research, future directions, and featured a mix of speakers from CRISP and non-JUMP PIs, as well as two panel sessions – "Academic Perspectives" and "Industry Perspectives." The Industrial panelists were all from SRC member companies – **Ameen Akel** (Micron), **Byeongho Kim** (Samsung), and **Nuwan Jayasena** (AMD).

NEW

SRC will be launching a new Collaborative Research Management platform in December! *Stay tuned.*

PILLAR SCIENCE

Why this platform? Why now?

Swaroop Ghosh Wins PSEAS's Outstanding Research Award

Swaroop Ghosh, associate professor at the School of Electrical Engineering and Computer Science a current LMD professor with previous projects in HWS and AIHW, has been recognized by The Penn State Engineering Alumni Society for his outstanding advisement of engineering undergraduate and graduate students. Award recipients were nominated by their respective departments and selected through secret ballot by committees composed of their peers, former award recipients, and members of the PSEAS board of directors. Congratulations, Swaroop!

Todd Younkin Delivered a Keynote Speech at IPC 2022

Todd Younkin, President and CEO of SRC, presented a compelling keynote presentation called "Packaging is the new king!" on October 12 at IPC's Advanced Packaging Symposium. His messages underscored the importance of and the need for chip R&D. He affirmed that investment in 3D heterogeneous integration is an urgent priority. He also underscored the importance of inspiring and educating the next generation of talent. He highlighted the ongoing work on a National Institute of Standards and Technology (NIST) advanced packaging roadmapping project, of which IPC is a part.

Tech Transfer Series

US 20210249331A1

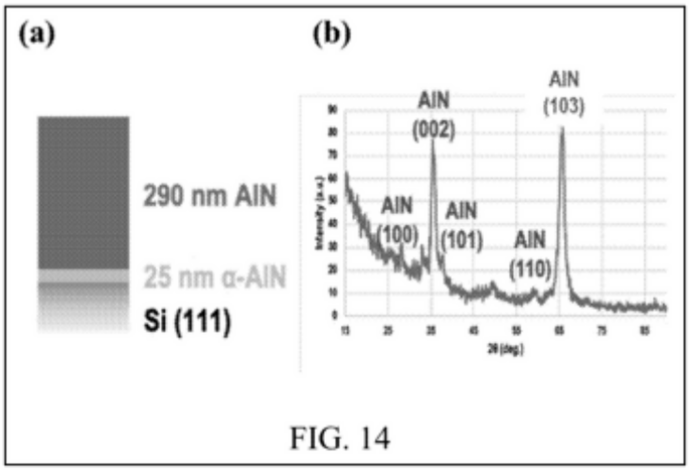


FIG. 14

This month's tech transfer series focuses on the UCSD team leading JUMP task #2776.058, *Novel Routes to ALD of Crystalline Materials at Low Temperature.* Started in 2018, the team, led by Prof. **Andy Kummel**, has emphasized the deposition of high-quality Aluminum Nitride (AlN) through a process called "atomic layer annealing" (or ALA), initially reported by researchers at National Taiwan University (NTU). The exploratory research led by SRC scholars **Scott Ueda** and **Aaron McLeod** out of the Kummel group resulted in highly impactful publications in 2019 and 2020, then collaborations with Stanford SRC scholars **Michelle Chen** and **Christopher Perez** out of Prof. **Eric Pop**'s group. As the AlNx work expanded, it seeded and drove other investments, including but not limited to: (1) a DARPA-sponsored special project on a *RoadMap for Thermal Boundary Resistance for AlN and Diamond RF Heater Spreaders*; (2) collaborative ASCENT-ComSenTer research on *Advanced Materials for 100-300 GHz Array Packages*; and (3) research in nCORE IMPACT Center task #2966.013 on *Novel Nanostructured Thermal Management Materials*. To date, the technology has led to two patent filings: (1) *Low-Temperature Deposition of High-Quality Aluminum Nitride Films for Heat Spreading Applications* (US20210249331A1), which includes co-inventors from UC/Santa Barbara, Stanford, and Raytheon Technologies; and (2) *Deposition of Aluminum Nitirde Templating Layers by Thermal Pulsed Chemical Vapor Deposition for the Enhancement of Aluminum Nitride Thick Films*, filed in May of 2022. SRC and its members are excited to see where this AlNx technology can deliver integrated thermal management solutions for both compute and RF.

Top 5 SRC Publications Viewed Across All Programs

Don't miss the papers that received the most views on the SRC website over the last six weeks. Members of the associated programs have early access to the pre-publications.

- In-Memory Computing: from Devices to Applications - A Cross-Layer Perspective (Publication P107462)
- 1.5 (presentation): P-MASSIVE: A Real-Time Search Engine for a Multi-Terabyte Mass Spectrometry Database (Publication P108328)
- 32.1 (presentation): Low Temperature Chemical Vapor Deposition of SiNx Thin Films in Deep Features (Publication P108122)
- Insight into Defect Formation and their Impact on Electrical Characteristics of Amorphous Oxide Semiconductor FETs (Publication P108802)
- 9.1 (poster): Cobalt Atomic Layer Deposition for Chip-to-Wafer Heterogeneous Integration and Bonding (Publication P108375)