2023 CALENDAR

Featuring the 13th-Annual
CFN Image Contest

Brookhaven National Laboratory

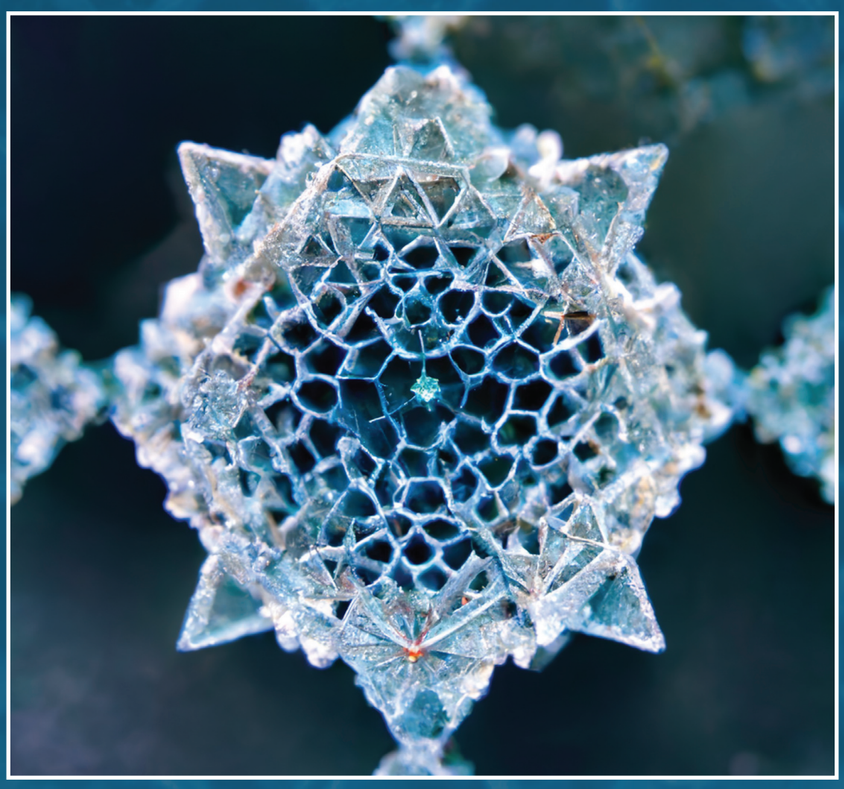
managed by Brookhaven Science Associates
for the U.S. Department of Energy

Center for Functional Nanomaterials

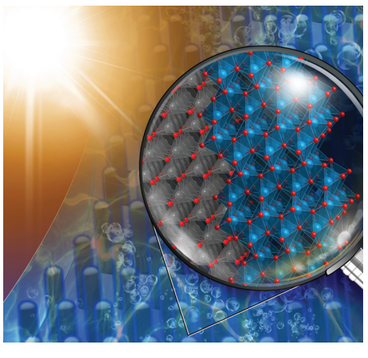
U.S. DEPARTMENT OF ENERGY

The Center for Functional Nanomaterials (CFN) is a DOE Office of Science User Facility at Brookhaven National Laboratory

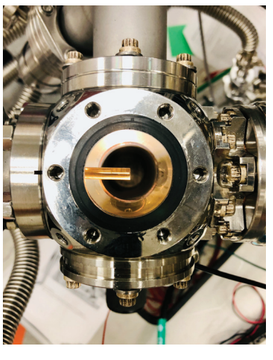
Brookhaven National Laboratory



This Image is Not Real!
It was generated by artificial intelligence (AI)
tasked with dreaming about nanomaterials. *This image was not generated using CFN equipment*. It was generated entirely by computer. (2nd Place Winner)
Kevin Yager, CFN Staff, Brookhaven National Lab

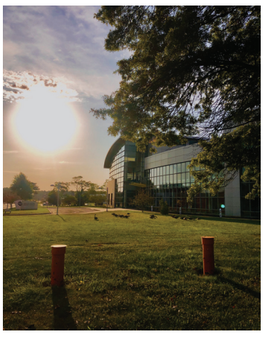


Nano Energy Powered by Self-sustained Nuclear Fusion
The material was created using the Atomic Layer Deposition and tested using the Photoelectrochemistry Test Station.
Mingzhao Liu, CFN Staff, Brookhaven National Lab

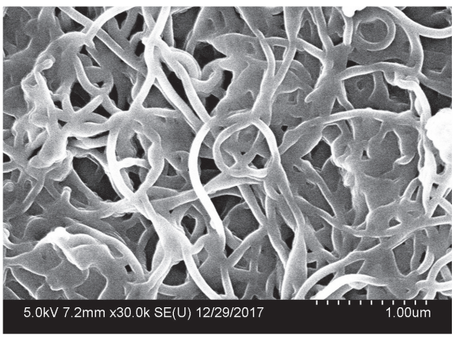


On your mark! Set! Go!
The image is taking during a training for the XPS tool where one could see through the chamber the sample at the tip of a metal rod ready to be transferred to the UHV chamber.
Mohamed Boukhicha, CFN User, Brookhaven National Lab

Autumn leaves fall, yet the CFN keeps rising
Manuel A. Lozano-Arroyo, CFN User, University of Puerto Rico

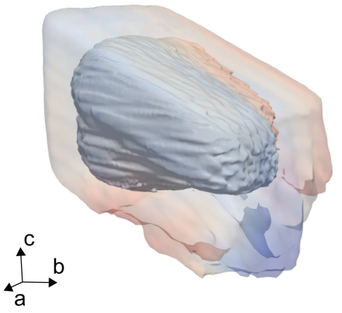


Home for the Day
Mohamed Boukhicha, CFN User, Brookhaven National Lab



A network of interpenetrating Carbon Nanotubes formed from a random array of multi-wall CNTs using high flux rate xenon ion bombardment with an energy of 2.87 keV and a total fluence of 2.23X10^18 ions per square cm. CFN instrument used: Hitachi 4800 Field Emission SEM

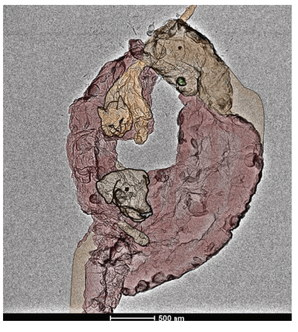
Gregory Konesky, CFN User, National NanoTech, Inc.



Magnetic domain found at the core of a micron-sized block of strontium iridate

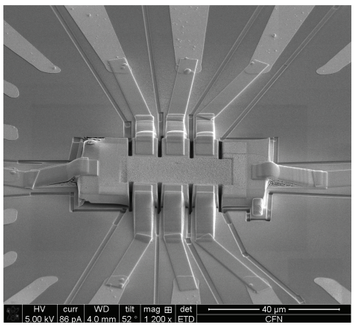
This picture, made by Longlong Wu in the CMPMS department, is of a strontium iridate crystal prepared by FIB in the CFN. It is 1.3 microns on a side. It was subsequently imaged by X-ray Bragg coherent diffraction imaging. It shows a magnetic domain inside the crystal.

Ian Robinson, CFN User, Brookhaven National Lab



This image was done by digital drawing and coloring over a base TEM image of turbostratic graphene taken with CFN's FEI Talos F200X by Kim Kisslinger as part of the project in our user proposal. The edited image depicts a person having their recharge time enveloped in a red heavy blanket along their pets: a cat and a dog. It reflects the importance of taking time to recover our energy to keep forging our path. CFN instrument used: FEI Talos F200X

Nataniel Medina Berríos, CFN User, University of Puerto Rico



Microdevice fabrication at the CFN

A thin slab of $ZrTe_5$ is carved from a bulk single crystal and shaped in a Hall bar geometry for transport studies of quantum materials with the use of the Helios FIB at the CFN cleanroom.

Pedro Mercado Lozano, CFN User, Stony Brook University

January 2023

S	M	T	W	TH	F	S
25	26	27	28	29	30	31
1	2 New Year's Day (observed) Lab Closed	3	4	5	6	7
8	9	10	11	12	13	14
15	16 Martin Luther King Jr.'s Day Lab Closed	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31 CFN Proposal Deadline	1	2	3	4

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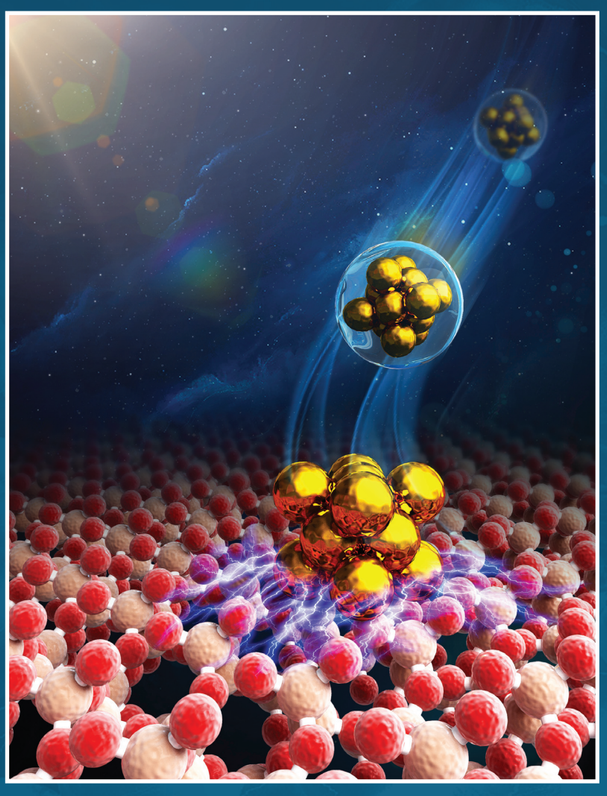

Gold nanoparticles can be deposited on SiO_2 surface with the protection of helium nanodroplets that evaporate after landing. An electric field formed at the gold/SiO_2 interface due a charge-transfer can facilitate catalytic reactions. CFN instruments used: Atomic Layer Deposition Tool, Dual Beam Scanning Electron/Focused Ion Beam microscope and Rapid thermal processing system were involved.
Haotian Yang, CFN User, Stony Brook University

Selected Journal Cover by The Journal of Physical Chemistry C
H. Yang, J. Cen, Q. Wu, C.J. Ridge, X. Tong, C. Zhou, V. Veerasamy, D. Su, C.M. Lindsay, M. Liu*, A. Orlov*. J. Phys. Chem. C, 126, 10 (2022).

December 2023

S	M	T	W	TH	F	S
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25 Christmas Day Lab Closed	26	27	28	29	30
31	1	2	3	4	5	6

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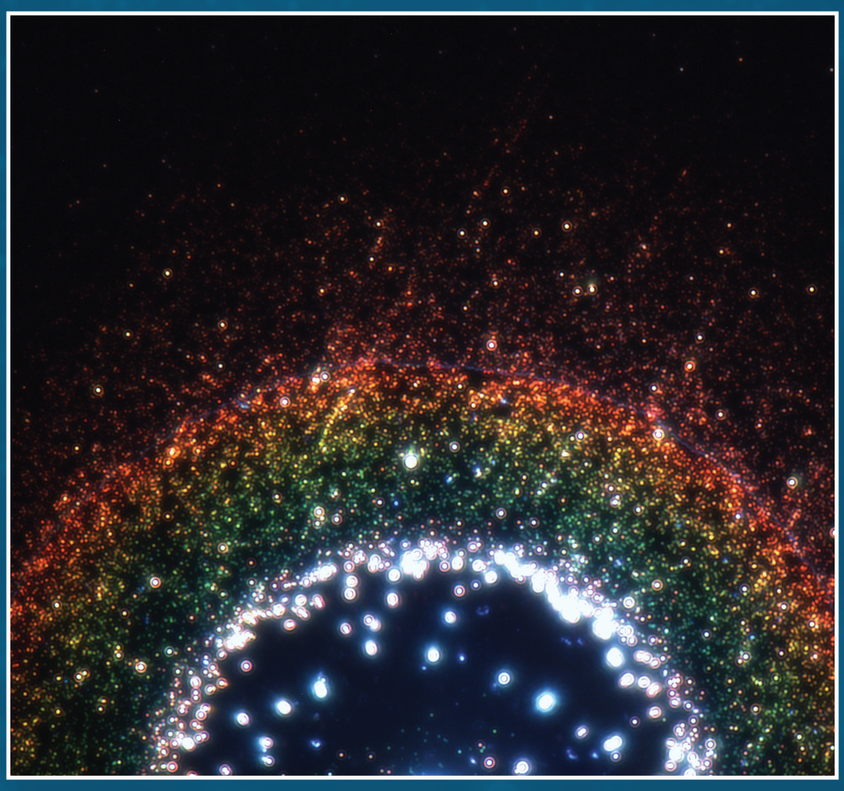
Live, Laugh, Love and Eat: QPress with Friends And Families
Suji Park, CFN Staff, Brookhaven National Lab

February 2023

S	M	T	W	TH	F	S
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20 President's Day Lab Closed	21	22	23	24	25
26	27	28	1	2	3	4
5	6	7	8	9	10	11

Become a CFN User: www.bnl.gov/CFN/user

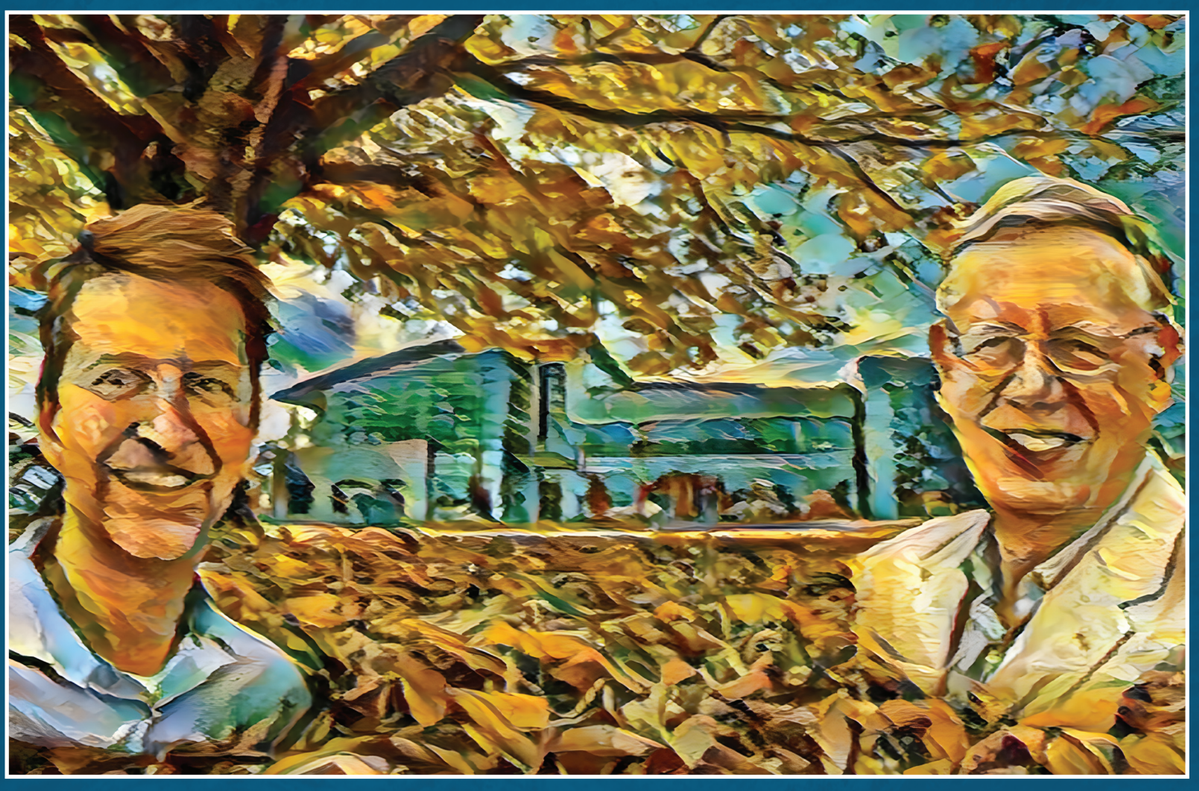


Nano Rainbow
A moment of gold nanoparticle (50 nm) agglomeration in its drying aqueous suspension around an air bubble. CFN instrument used: Nikon Eclipse Ti2 Hyperspectral Dark Field Microscope. (1st Place Winner)
Feiyue Teng, CFN Postdoctoral Researcher, Brookhaven National Lab

November 2023

S	M	T	W	TH	F	S
29	30	31	1	2	3	4
5	6	7	8	9	10 Veteran's Day Lab Closed	11
12	13	14	15	16	17	18
19	20	21	22	23 Thanksgiving Day Lab Closed	24 Day After Thanksgiving Lab Closed	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9

Become a CFN User: www.bnl.gov/CFN/user

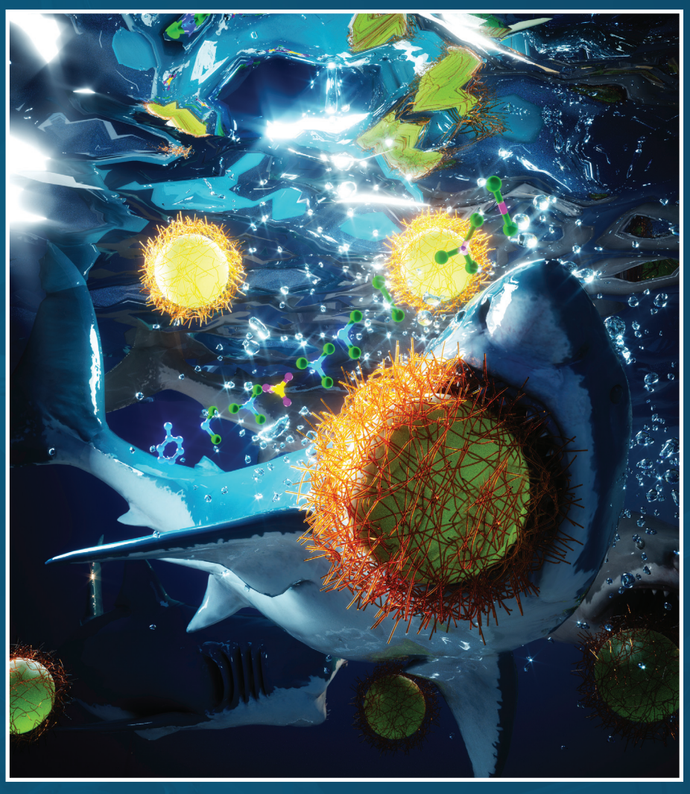


Painting of CFN Directors
Image generated by an AI mimicking the style of Vincent van Gogh. (2nd Place Winner)
Kevin Yager, CFN Staff, Brookhaven National Lab

March 2023

S	M	T	W	TH	F	S
26	27	28	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

Become a CFN User: www.bnl.gov/CFN/user



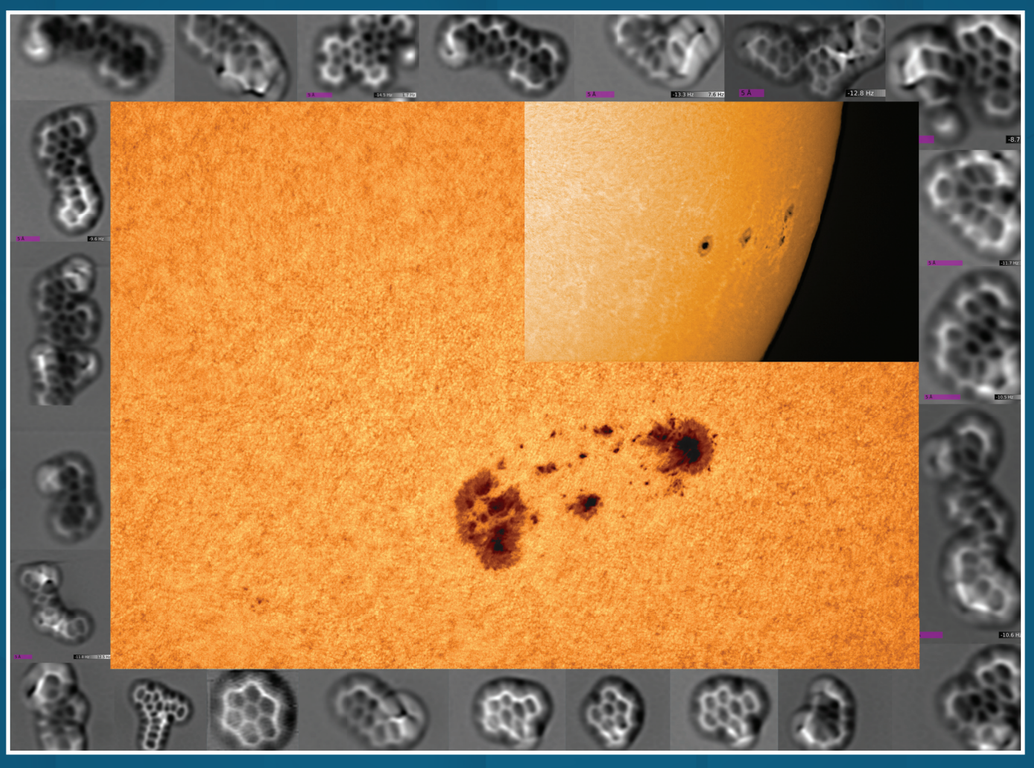
The study addressed the challenge of stability of nanoparticles (NPs) in physiological media or organic solvents. Designed organic molecules (peptoids) can act as molecular stabilizers for NPs in varied solution environments and at liquid interfaces, while providing a small shell thickness. The particle "toughness" is represented by its ability to resist a shark. CFN capabilities used: CFN Materials Synthesis and Characterization Facility, lab SAXS, TEM, and partner SAXS beamlines at NSLS-II.
Oleg Gang, CFN Staff, Brookhaven National Lab

Selected Journal Cover by the Journal of the American Chemical Society
S.T. Wang, H. Zhang, S. Xuan, D. Nykypanchuk, Y. Zhang, G. Freychet, B.M. Ocko, R.N. Zuckermann, N. Todorova, O. Gang*. J. Am. Chem. Soc., 144, 18 (2022).

October 2023

S	M	T	W	TH	F	S
1	2	3	4	5	6	7
8	9 National Nano Day / Columbus Day Lab Closed	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

Become a CFN User: www.bnl.gov/CFN/user



Scale Contrasts: From the Quantum world at molecular scale and resolution to our star in our solar system at it's current solar activity maximum (custom rebuild LT-STM/AFM vs. home build telescope's view from my drive way).
Percy Zahl, CFN Staff, Brookhaven National Lab

April 2023

S	M	T	W	TH	F	S
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24 NSLS-II, CFN & LBMS User Meeting	25 NSLS-II, CFN & LBMS User Meeting	26 NSLS-II, CFN & LBMS User Meeting	27 NSLS-II, CFN & LBMS User Meeting	28 NSLS-II, CFN & LBMS User Meeting	29
30	1	2	3	4	5	6

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Photo of the CFN modified using DALL·E 2, an artificial intelligence system for generating and editing images (reference: https://openai.com/dall-e-2/)
Anibal Boscoboinik, CFN Staff, Brookhaven National Lab

September 2023

S	M	T	W	TH	F	S
27	28	29	30	31	1	2
3	4 Labor Day Lab Closed	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30 CFN Proposal Deadline
1	2	3	4	5	6	7

Become a CFN User: www.bnl.gov/CFN/user

The Sky Speaks in a Thousand Colors
Outside the CFN building. (1st Place Winner)
Sayantani Sikder, CFN User, Stony Brook University

May 2023

S	M	T	W	TH	F	S
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29 Memorial Day Lab Closed	30	31 CFN Proposal Deadline	1	2	3
4	5	6	7	8	9	10

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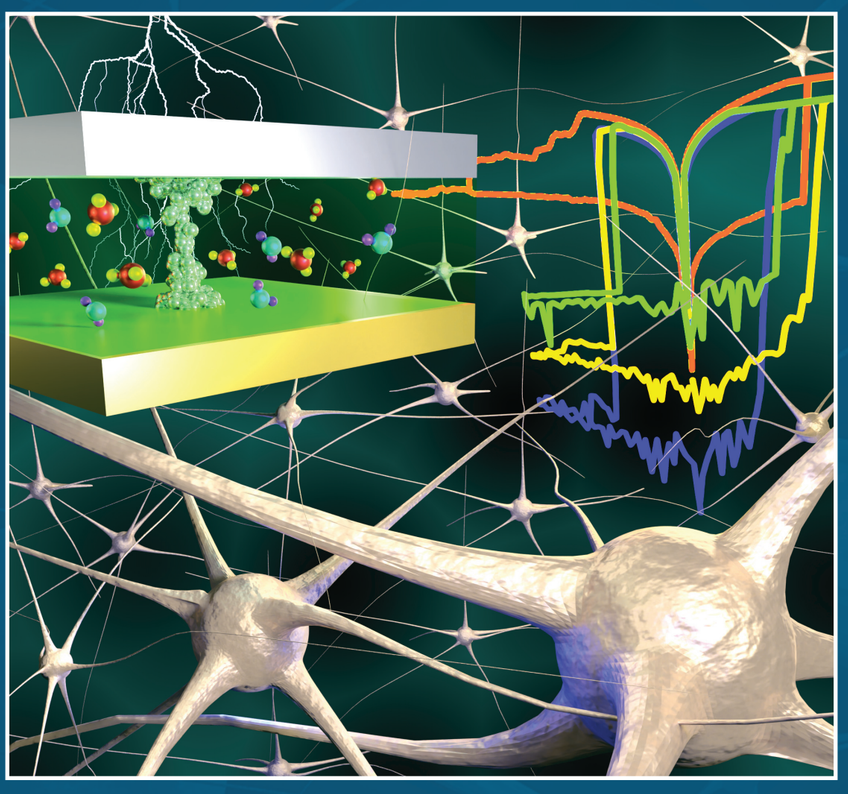
View From a Chamber Viewport
Trapping Xenon in nanocages impregnated on Ru powder. The purple color comes from Xe plasma used as part of the experiment. CFN capabilities used: CFN Proximal Probes Facility
Anibal Boscoboinik, CFN Staff, Brookhaven National Lab

August 2023

S	M	T	W	TH	F	S
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Become a CFN User: www.bnl.gov/CFN/user



Hybrid Neuromorphic Resistive Memory
This work demonstrates control of device switching parameters and reduced stochastic switching, which are critical technology issues for resistive random-access memory (RRAM). These devices show promise as multi-level memories, which are essential elements in neuromorphic computing. The hybrid material was created by vapor-phase infiltration of alumina into silver-doped SU-8 — a conventional photoresist.
The CFN Electron Microscopy, Nanofabrication, and Materials Synthesis & Characterization Facilities were used in this study.
Ashwanth Subramanian, CFN User, Stony Brook University

Selected Journal Back Cover by Advanced Electronic Materials
A. Subramanian, N. Tiwale, K. Kisslinger, C,Y. Nam*. Adv. Electron. Mater., 8, 7 (2022).

June 2023

S	M	T	W	TH	F	S
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19 Juneteenth Lab Closed	20	21	22	23	24
25	26	27	28	29	30	1
2	3	4	5	6	7	8

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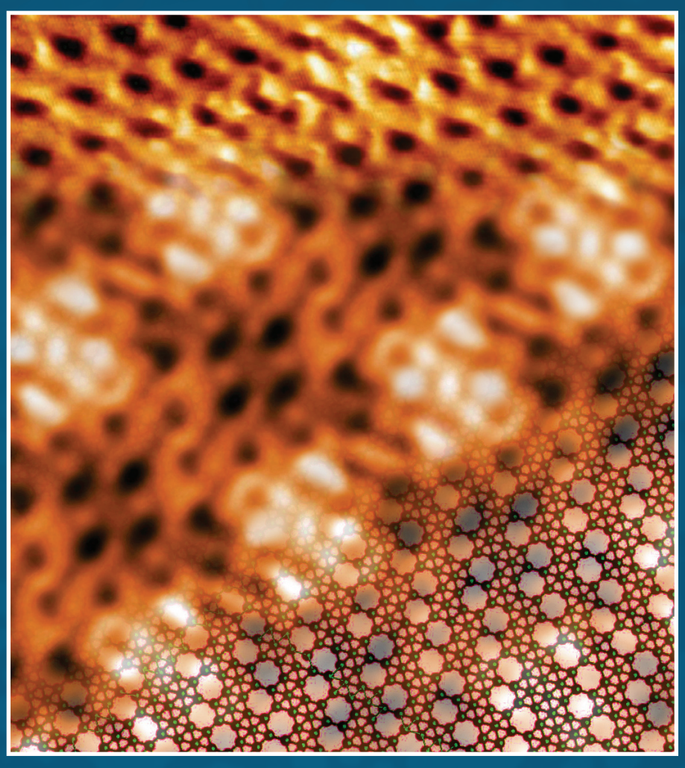

Borophene in Top Form

Two-dimensional layers of boron atoms have been grown on a variety of surfaces, typically noble metals. Borophene sheets can form different polymorphs with different properties, which is attractive for applications, but for practical use larger flakes with weaker metal–substrate interactions are required. Now, Rongting Wu, Sohrab Ismail-Beigi, Ivan Božović, and co-workers have synthesized micrometer-scale single-crystalline borophene on a square-lattice Cu (100) surface.

Rongting Wu, CFN User, Yale University

Selected Journal Cover by Nature Chemistry

R. Wu, S. Eltinge, I.K. Drozdov, A. Gozar, P. Zahl, J.T. Sadowski, S. Ismail-Beigi*, I. Božović*. Nat. Chem., 14, 4 (2022).

July 2023

S	M	T	W	TH	F	S
25	26	27	28	29	30	1
2	3	4 Independence Day Lab Closed	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

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