SAND2021-12452PE

Sandia National Laboratories

Exceptional service in the national interest

From Benchtop Chemistry/Materials to Nationally & Globally-Relevant Technologies

Cody Corbin, PhD
Senior Member of Technical Staff
Synthetic Materials & Chemistry
Biological & Chemical Sensors Dept.
Sandia National Laboratories

World-changing technologies. Life-changing careers.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Sandia's Impact

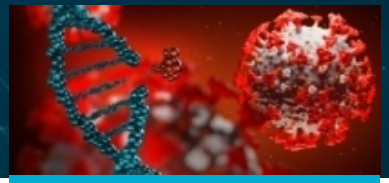
Sandia is often called upon to respond to high-profile events

Mars Perseverance rover

NASA's Perseverance rover landed safely on Mars after a seven-month journey through space. The event could only take place following a safe launch that had been vetted by Sandia scientists.
(Courtesy of NASA/JPL-Caltech)

Cleanroom invented 1963

As the birthplace of the modern cleanroom, Sandia helped revolutionize manufacturing in electronics and pharmaceuticals and advance space exploration. $50 billion worth of cleanrooms built worldwide.



COVID-19 Pandemic

Sandia researchers are using CRISPR based technology to genetically engineer a deployable antiviral countermeasure for COVID-19. Their goal is to create an antiviral that will be customizable to respond to many different viruses.
(Image by Loren Stacks)

Sustainable Energy

Sandia seeks to support the creation of a secure energy future for the US by using its capabilities to enable an uninterrupted and enduring supply of energy from domestic sources, and to assure the reliability and resiliency of the associated energy infrastructure.

Learn the 70 ways Sandia has impacted our nation

Sandia - Today

As a multi-faceted national security laboratory, Sandia develops advanced technologies to ensure global peace.

At Sandia, you can become part of something more—and contribute to our quest to render exceptional service in the national interest.

U.S. National Laboratories

Sandia Has Two Main Locations

Fulfilling Our National Security Mission

Global Security

Nuclear Deterrence

National Security Programs

Energy & Homeland Security

Advanced Science & Technology

[illegible] challenges today and in the future.

Our Workforce & Culture

Our Workforce ~15,000 employees

~12,900 Regular employees

~2,100 Temporary employees, students & postdoctoral appointees

New Mexico Site: *(see breakout)*

Workforce: ~13,200

R&D employees: ~6,700

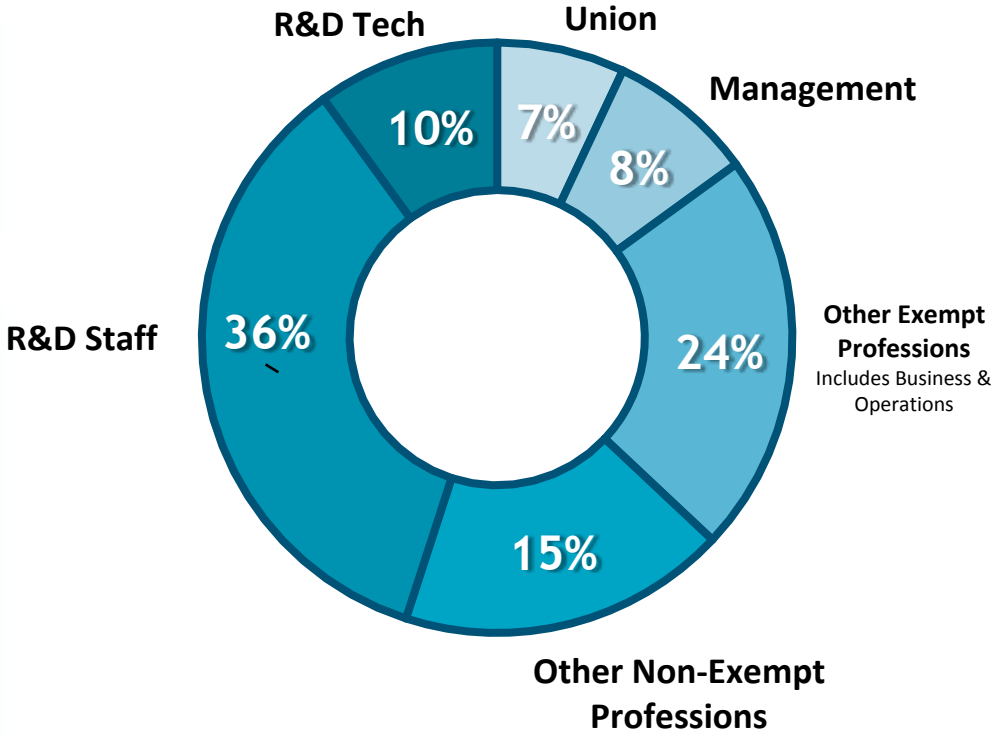
(R&D Staff & Technologists)

California Site: *(see breakout)*

Workforce : ~1,800

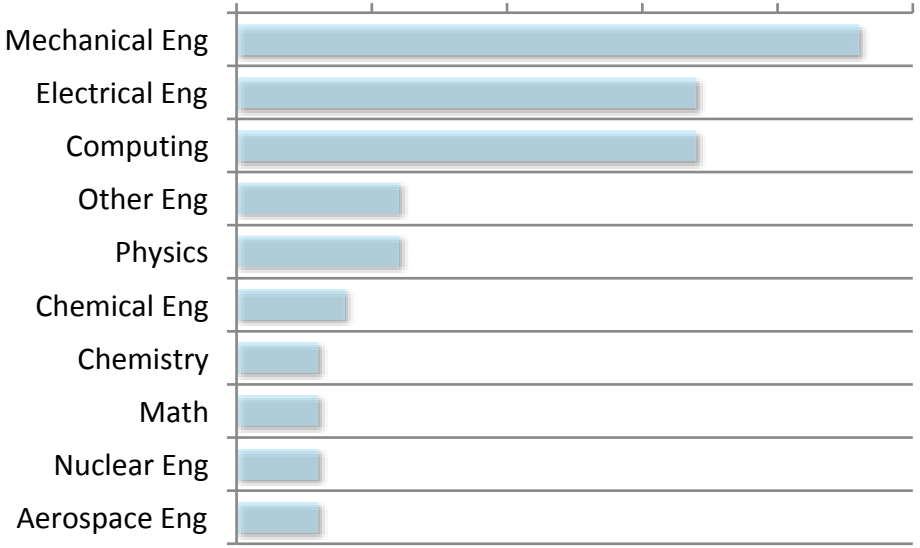
R&D employees: ~940

(R&D Staff & Technologists)

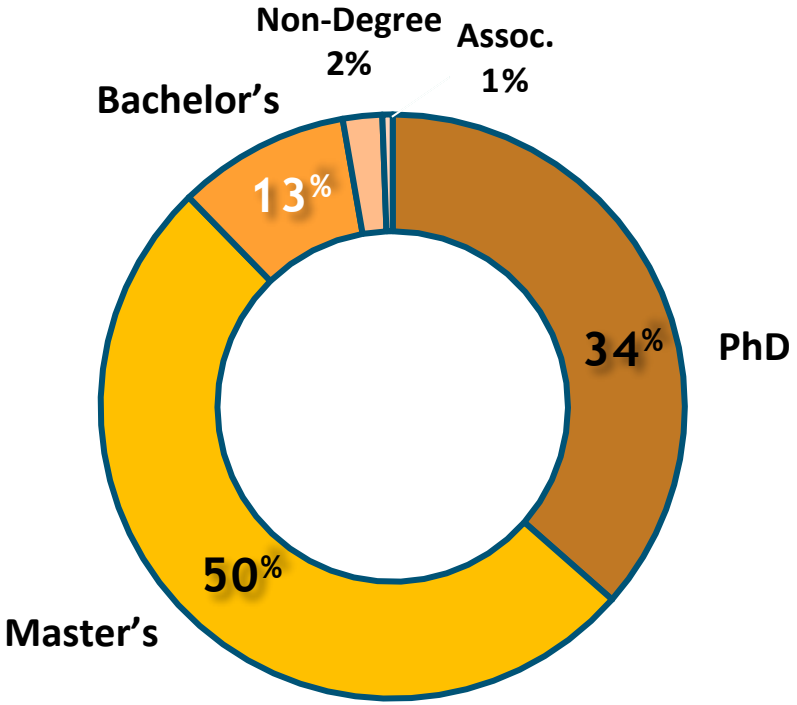


Data as of July 2021

R&D by Discipline & Degree

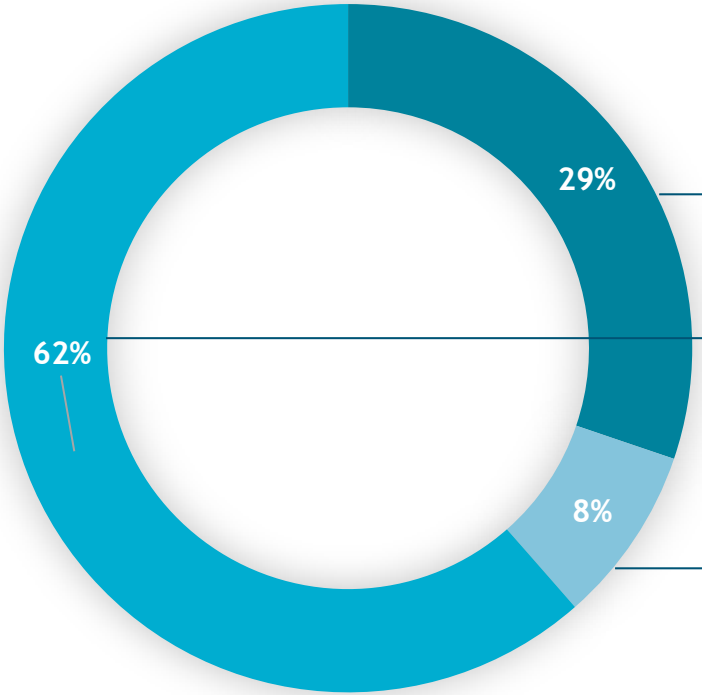


Top 10 job descriptions shown, Regular exempt non-management employees only



Data as of July 2021

Sandia's Funding ~ $3.9 Billion



Strategic Partnerships Projects
$1,168.9 Million

NNSA
$2,436.1 Million

Non-NNSA DOE
$314.1 Million

Funding by Source Total FY20

Working at Sandia

Quality of Work-Life

Flexible Work Schedules

- 9/80 and 4/10 workweek options *
- Generous Paid Time Off
- 11 paid holidays – includes a winter shutdown at the end of each calendar year
- Telecommuting arrangements*
- Part-time options*
- Vacation Buy Plan

* *with management approval*

Family Life

- Paid family leave
- Resource and Referral services
- Adoption assistance
- Family recreational activities
- Expectant Parent Program

On-site Amenities

- On-site Medical Clinic
- Sandia Laboratory Federal Credit Union
- On-site Café
- On-site Fitness Center
- Access to group exercise classes, clubs and sports activities
- Employee self-formed sports teams

Available at NM & CA sites

Health & Benefits

- Robust medical, dental & vision plans
- Life, accident, and disability insurance
- Healthcare and dependent care spending accounts
- Exceptional 401(k) Plan
- Employee discounts
- Voluntary benefits like pet, auto, and home insurance as well as identity theft protection
- Tuition assistance

Living in Albuquerque

Watch:
Sandia New Mexico Video

Life in Albuquerque

- Albuquerque is the largest city in New Mexico with a population of over 500,000
- Affordable housing, reasonable cost of living
- Minimal traffic congestion compared to larger cities

Albuquerque Environment

- High desert climate with 278 annual days of sunshine
- Average temperatures between 78˚ and 40˚
- Wide-open spaces

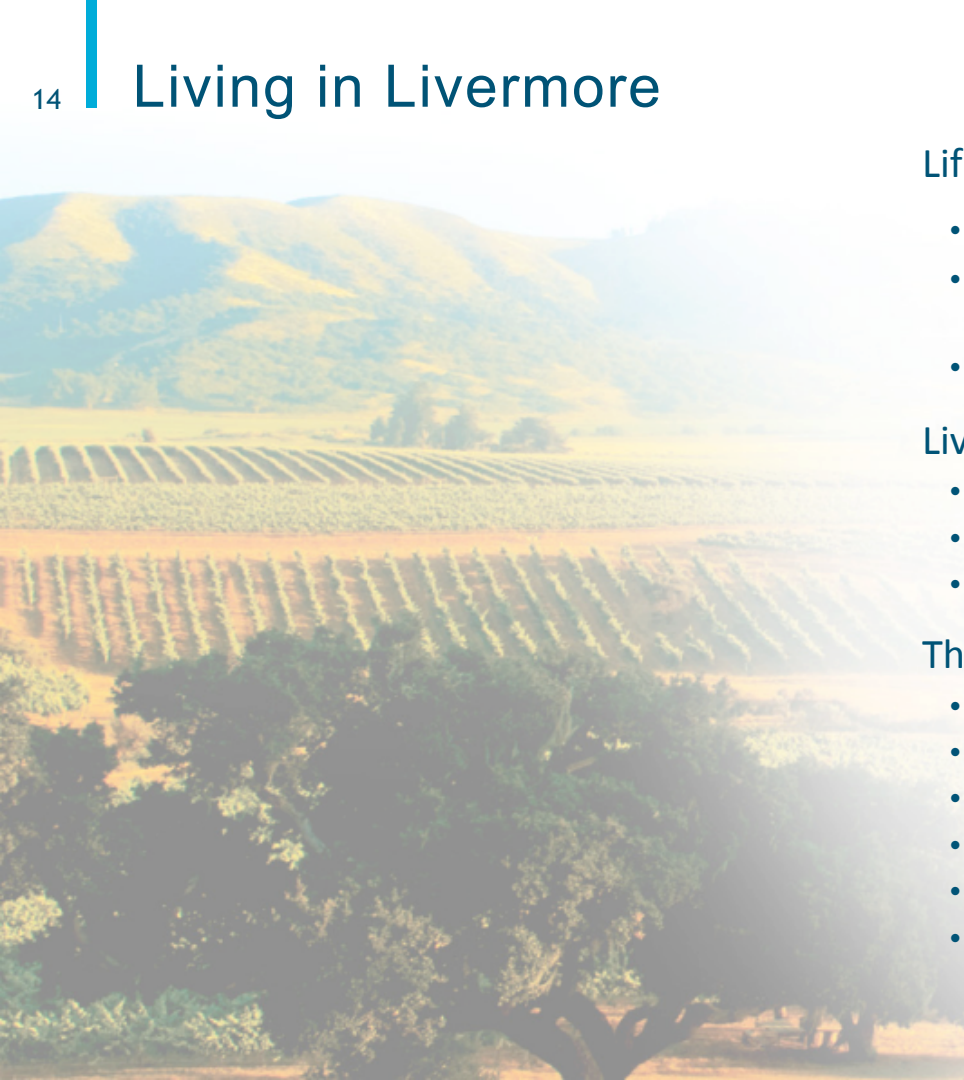
Things to Do

- Outdoor recreation - Ski, snowboard, hike, etc.
- Santa Fe – rich culture
- International Balloon Fiesta
- Explore Indian pueblos and our Hispanic heritage
- Green chile – NM Cuisine
- Museums, Parks, Sports

Photo Credit:
MarbleStreetStudio.com

Living in Livermore

Watch:
Sandia California Video



Life in Livermore

- Livermore's relaxed lifestyle includes a population of ~90,000
- Close proximity to first-tier universities, Silicon Valley companies, and other top research laboratories and facilities
- Access to California's finest public and private schools

Livermore Environment

- 260 annual days of sunshine
- Average temperatures between 73˚ and 46˚
- Annual average rainfall: 14.8 inches

Things to Do

- Vineyards
- Beaches
- State Parks
- Sports – Nearby are six major league franchises
- Art haven
- Proximity to SF Bay Area

Career Opportunities

Internships

Encourages qualified students to develop interests in critical skills areas related to our mission, with the ultimate objective of developing our pipeline for our future. Available for Summer, Year Round and Co-op.

Eligibility Criteria

- Full-time enrollment status at an accredited school during the academic school year
- Undergraduate equivalent of 12 hours per semester
- Graduate equivalent of 9 hours per semester
- Must have a minimum cumulative GPA of 3.0 on a 4.0 scale for Technical, R&D, and Business interns; 2.5 on a 4.0 scale for Clerical and Labor interns
- Have U.S. citizenship for positions that require a security clearance or as stated in the job posting
- At least 16 years of age

Post-doc Opportunities

Key areas for post-docs at Sandia:

- Computer science/Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- High-performance computing
- Microelectronics and microfluidics
- Nanotechnology
- Physics
- Chemistry/ Electro Chem
- Biosciences and biotechnology
- Radiation & electrical sciences
- Engineering sciences
- Pulsed power sciences
- Materials science & engineering

Eligibility Criteria

- A recent PhD (conferred 5 years prior to employment) or the ability to complete all PhD requirements before hire date.

Fellowship Opportunities

Sandia provides postdoctoral fellows with professional development opportunities and prepares fellows to conduct independent, groundbreaking research.

- **Distinguished Fellowships**
  - Applications due October 15th, 2021 for a start date of October 1st, 2022
    - Three-year appointment
  - President Harry S. Truman Fellowship
  - Jill Hruby Fellowship

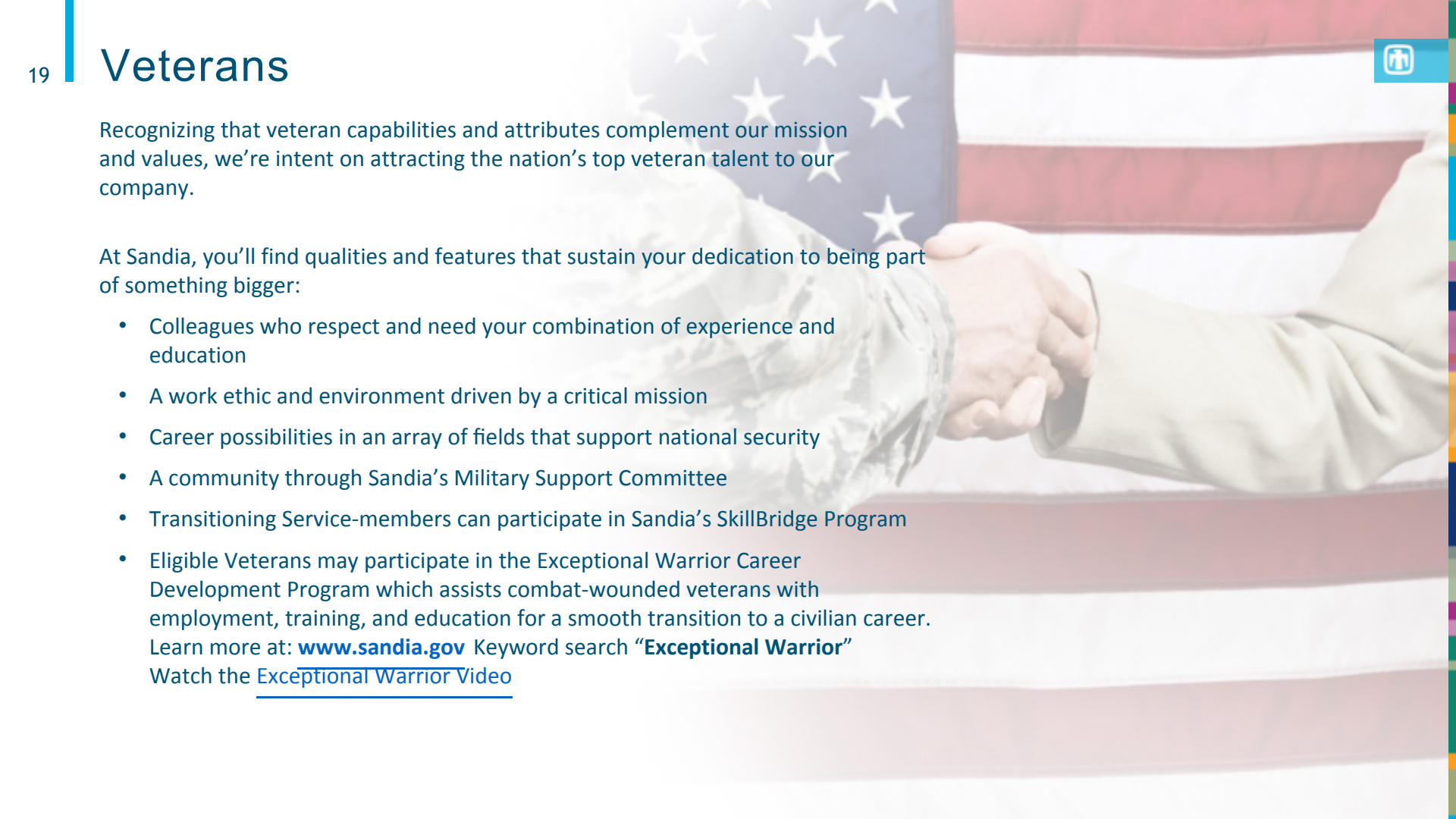
- **Foundation Fellowships**
  - Applications due in fall - November 2021
  - Two-year appointments
  - John von Neumann Fellowship
  - Sandia Data Science Fellowship
  - Maxwell Fellowship

Veterans

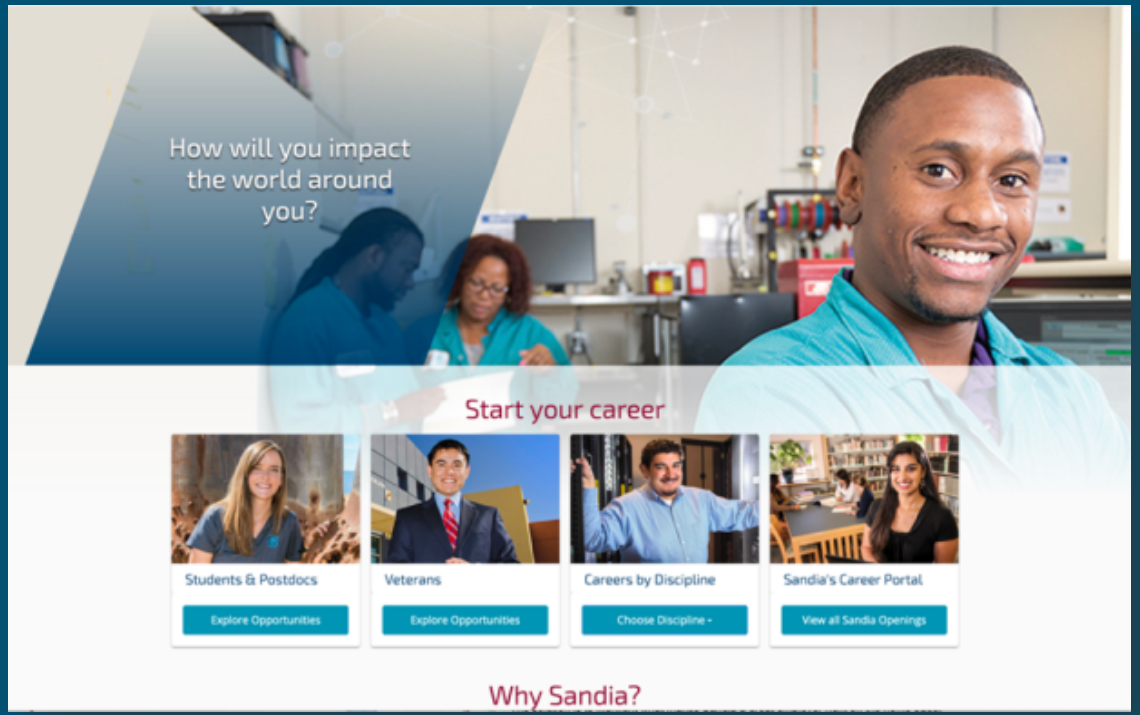
Recognizing that veteran capabilities and attributes complement our mission and values, we're intent on attracting the nation's top veteran talent to our company.

At Sandia, you'll find qualities and features that sustain your dedication to being part of something bigger:

- Colleagues who respect and need your combination of experience and education
- A work ethic and environment driven by a critical mission
- Career possibilities in an array of fields that support national security
- A community through Sandia's Military Support Committee
- Transitioning Service-members can participate in Sandia's SkillBridge Program
- Eligible Veterans may participate in the Exceptional Warrior Career Development Program which assists combat-wounded veterans with employment, training, and education for a smooth transition to a civilian career.
  Learn more at: **www.sandia.gov** Keyword search "**Exceptional Warrior**"
  Watch the Exceptional Warrior Video

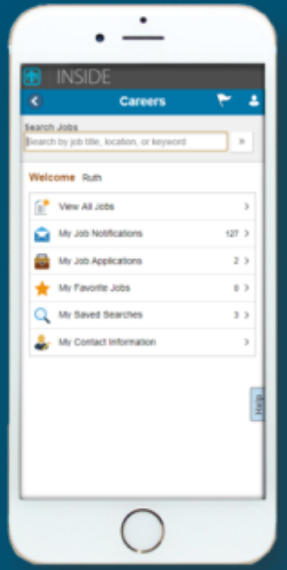


Apply Online! sandia.gov/careers

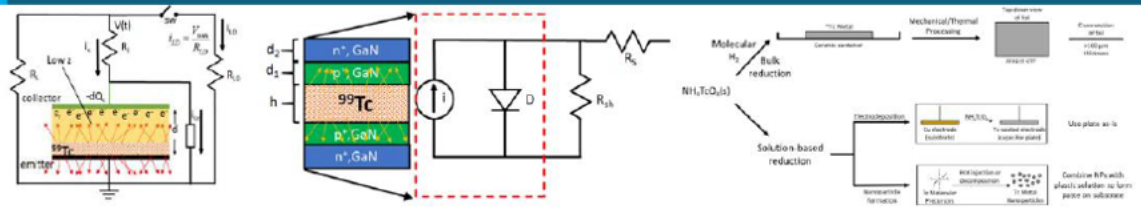


Sign up for Automated Job Notifications!

Mobile Job Applications

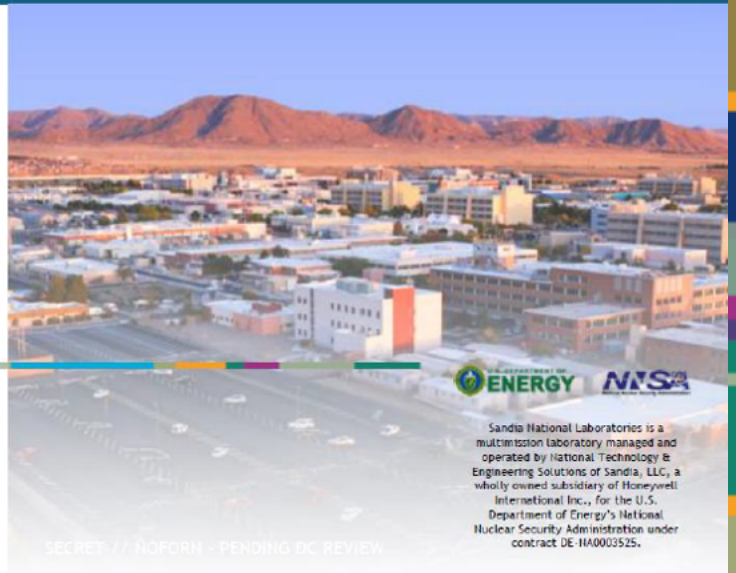


Infinite Lifetime Power Technologies Based on Technetium-99



PRESENTED BY

Cody Corbin, Sandia National Laboratories



Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Infinite Lifetime Power Technologies Based on Technetium-99

Cody Corbin

Relevant Beta Sources

Beta-based Sources	Half-Life (yrs)	Specific Activity (Ci/g)	E_{max} & E_{avg} (keV)	Density (g/cm^3)	Radiotoxicity[1]
Tritium (H-3)	12.3	~ 9,650	19 & 6	Low	Low
Nickel-63	~ 100	~ 9.6	67 & 17	8.9	Medium
Technetium-99	~ 212,000	0.017	296 & 86	11.5	Low

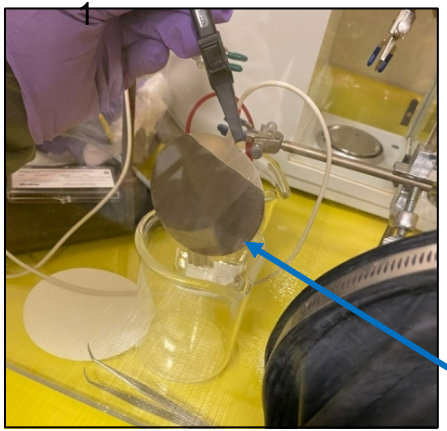
The deliverable from this R&D will include all data related to the electrical variables and power efficiencies that can be achieved in a definitive size.

[1]DOE/LLW-126: National Low-Level Waste Management Program Radionuclide Report Series, Volume 10: Nickel-63

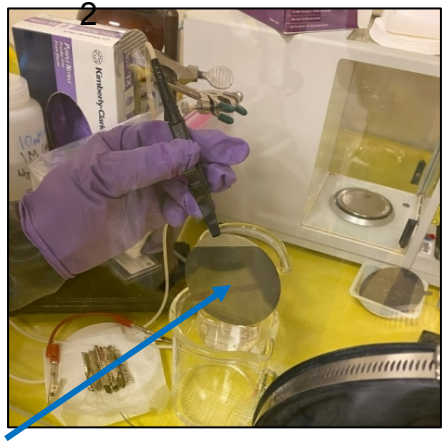
Infinite Lifetime Power Technologies Based on Technetium-99

Electrochemistry Setup

Stainless steel disk 1



Stainless steel disk 2

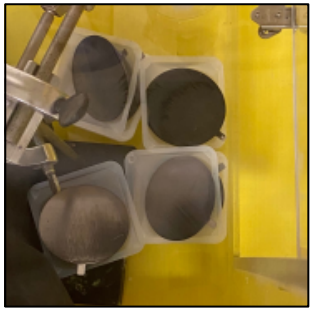


Visible film formed on each

Results from electrochemical depositions so far

SS	Current (A)	Time (s)	Mass Initial (g)	Mass Final (g)	Deposition Mass (g)	mg/cm2
A	1	30	20.3825	20.3847	0.0022	0.021884
B	1	60	20.2404	20.2546	0.0142	0.14125
C	1	300	20.2051	20.2288	0.0237	0.235748
D	1	600	20.2928	20.3377	0.0449	0.446629
E	2	~270	20.3996	-	-	-
F	1	600	20.2568	20.2941	0.0373	0.37103
G	1	600	20.3322	20.3689	0.0367	0.365062

Collection of disks



Sandia National Laboratories

Tamper-Indicating Enclosures with Visually Obvious Tamper-Response: Sensor Synthesis Strategies

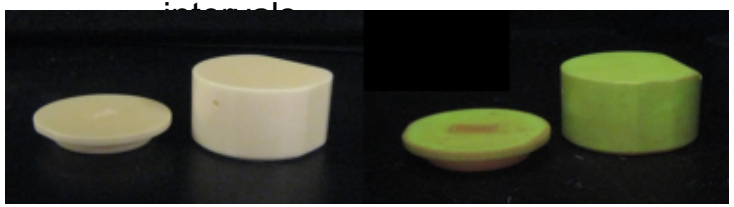
PRESENTED BY

Cody Corbin, Sandia National Laboratories

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

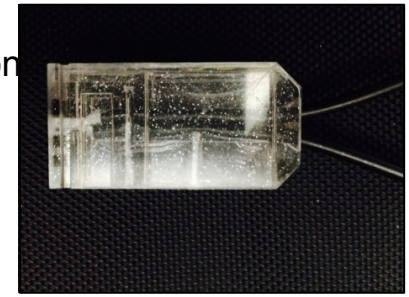
Containment/Surveillance (C/S) and international safegu

- Basic verification method used by the IAEA is Nuclear Material Accountancy (NMA), achieved through inspections, examination of records and reports, materials measurements
- In “traditional” international safeguards, accountancy ensures that nuclear materials are present and used as intended
  - State declares nuclear materials and facilities
  - Independent inspections periodically verify the declaration
  - C/S are technical means to maintain continuity of knowledge (CoK) between inspec



“Frangible” Ceramic Seal, with fluorescent tamper-indicating coatings, SNL/SRNL

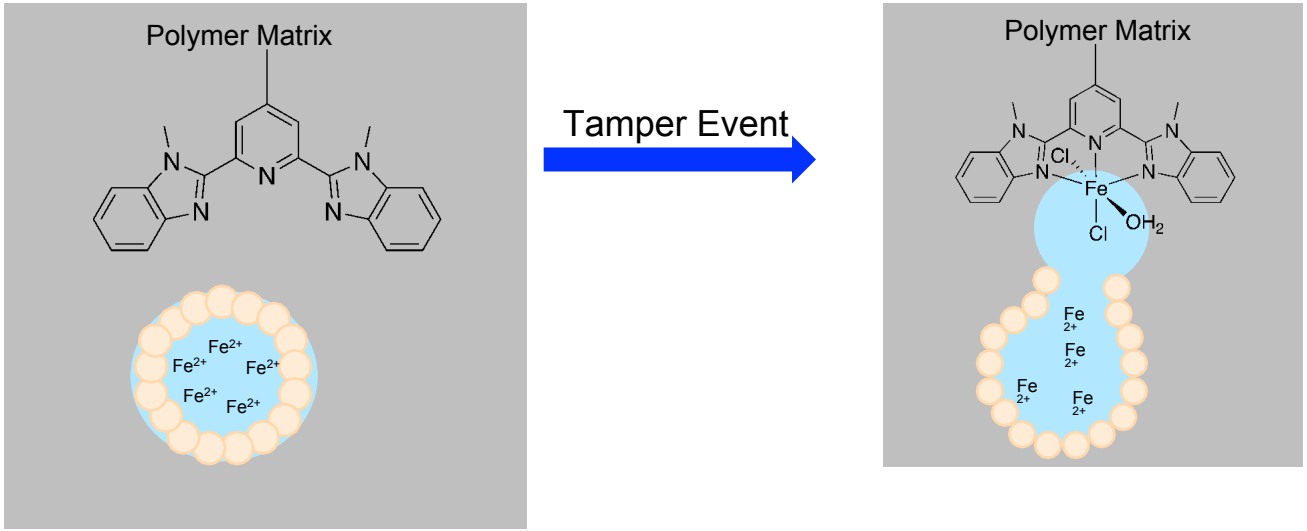
“Frangible” Glass Seal, IAEA



Cobra 5 seal with embedded hematite, Aquila. Photo courtesy SNL.

NGSS using anodized aluminum, Canberra (Mirion)

Transition Metal Complexes with Sensor

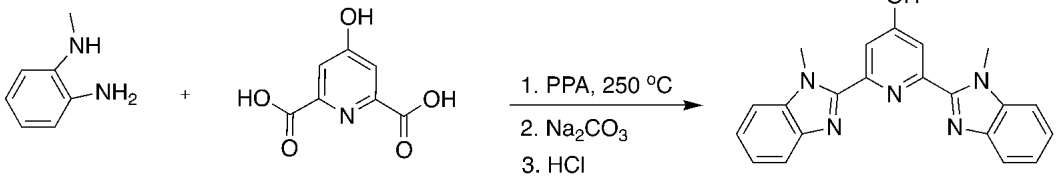


Tamper event releases $FeCl_2 \cdot 4H_2O$ and the sensor chelates to Fe(II) to cause a color change

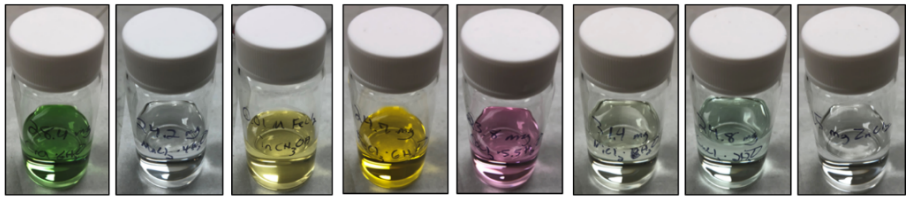
- Not limited to $FeCl_2 \cdot 4H_2O$
- $FeCl_3 \cdot 6H_2O$ is more robust to oxidation

Investigation of Transition Metal Salts and Sen

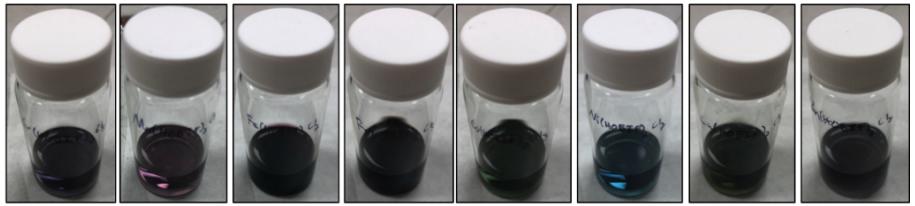
Matt Humphries



Largy, E. et. al. Chem. Eur. J. **2011**, *17*, 13274.



Cr^{3+} Mn^{2+} Fe^{2+} Fe^{3+} Co^{2+} Ni^{2+} Cu^{2+} Zn^{2+}



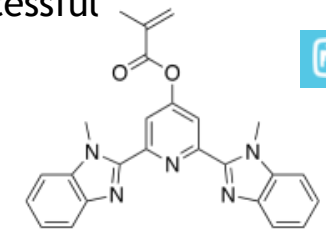
<u>Sensor</u>

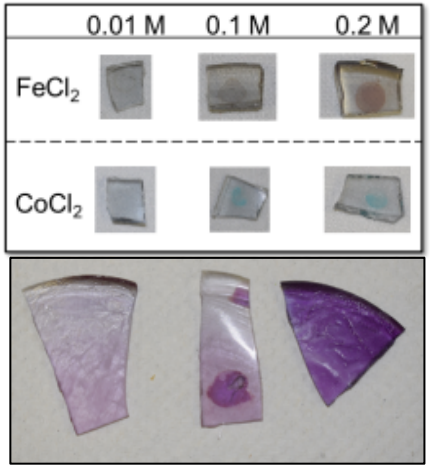
- HO-BIP – synthesized
- Produces purple solution

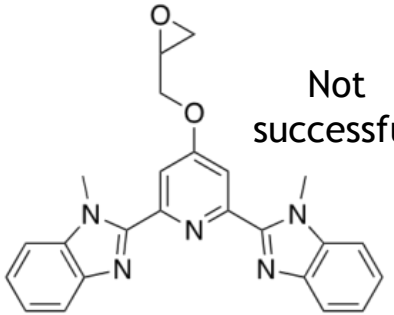
<u>Sensor + TM</u>

- 1 – 3 mg/mL Metal Chloride Solutions
- Much more dramatic color changes
  - Colored sensor
  - Stronger sensor-transition metal interaction

Successful





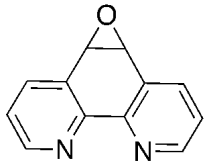


Not successful

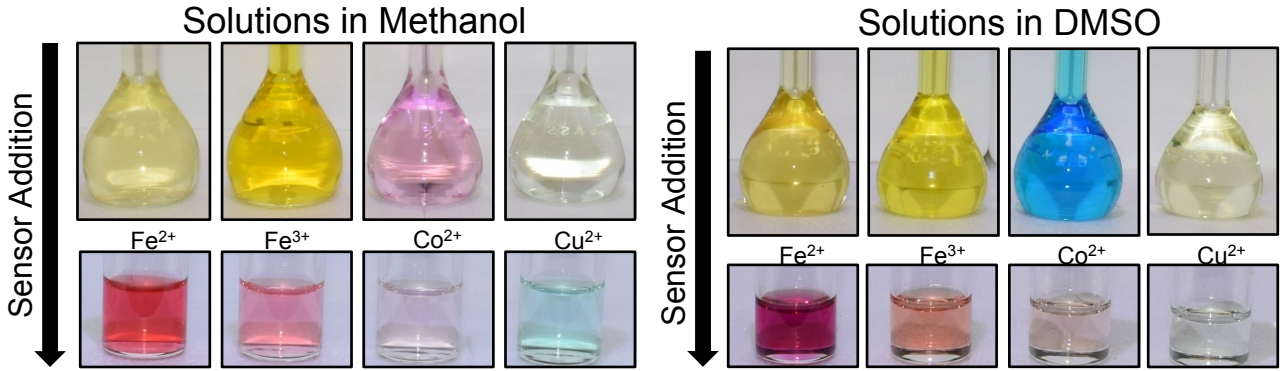
Investigation of Transition Metal Salts and Sensors

Sensor

- Commercially available phenanthroline

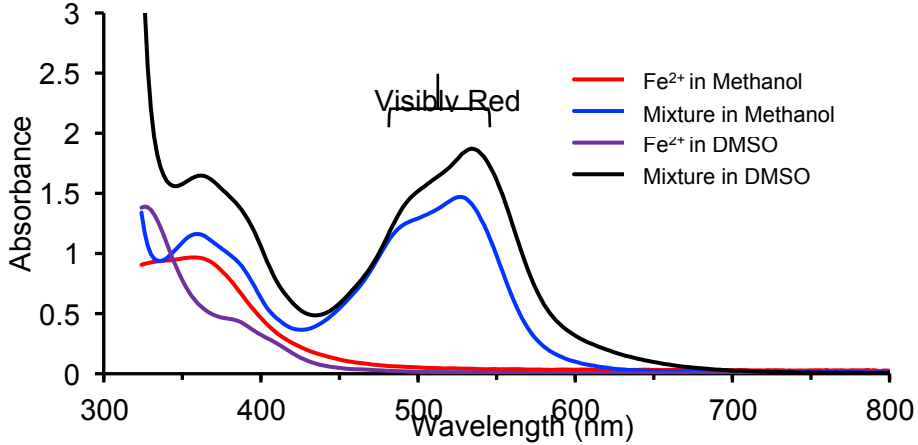


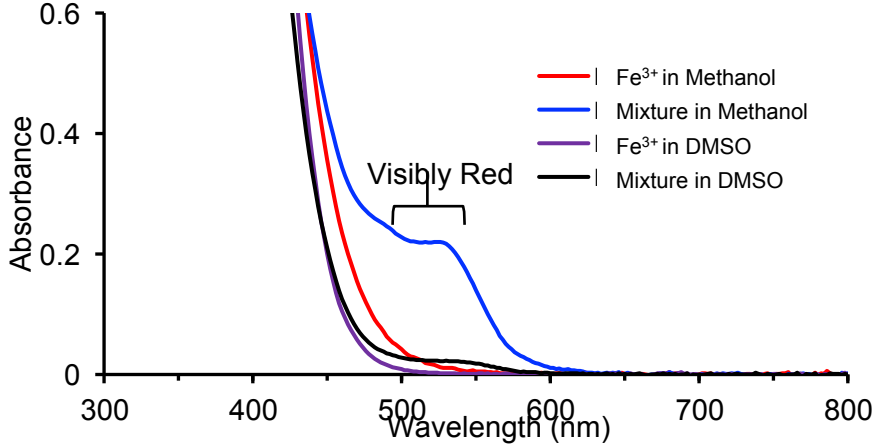
Colorless Sensor Solution

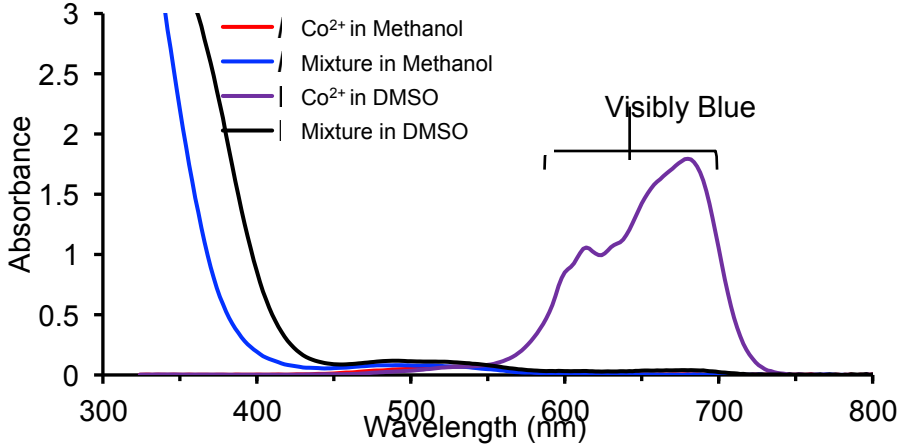


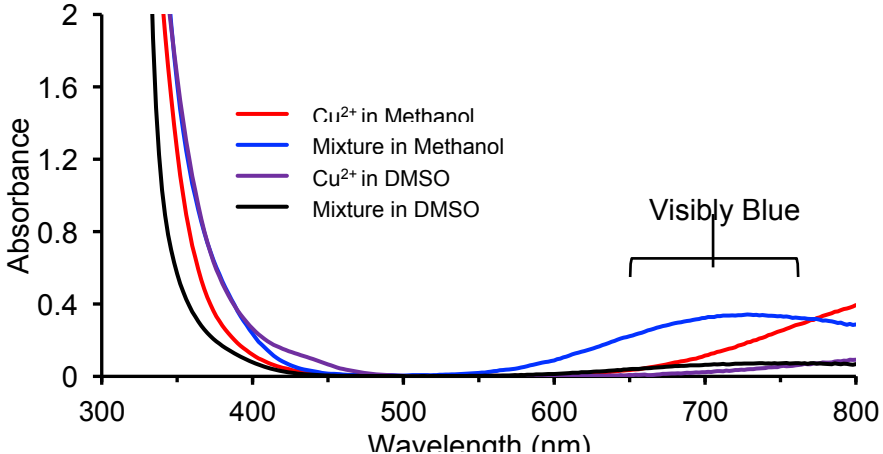
- 1– 3 mg/mL Metal Chloride Solutions; 1:1 ratio of TM to sensor
- Fe^{2+} yields the most dramatic color change, but it is prone to oxidation

Investigation of Transition Metal Salts and Sensors

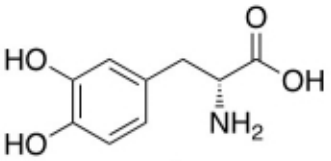






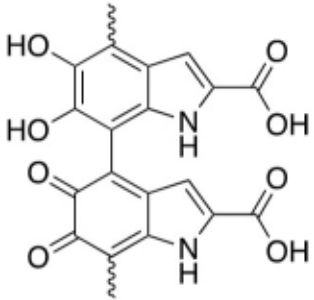


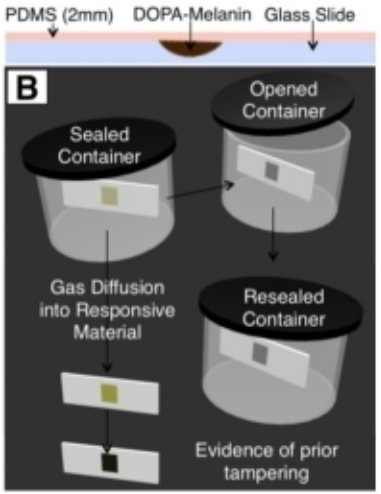
O_2-Sensitive Tamper Indicating Material

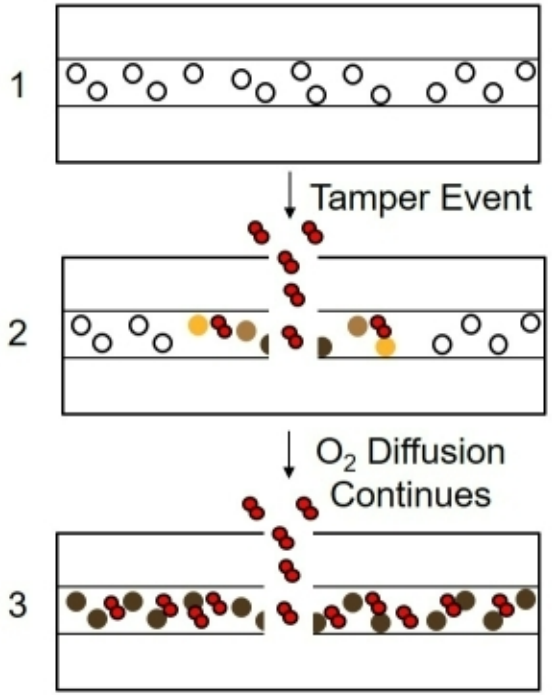


in KOH(aq)

O_2







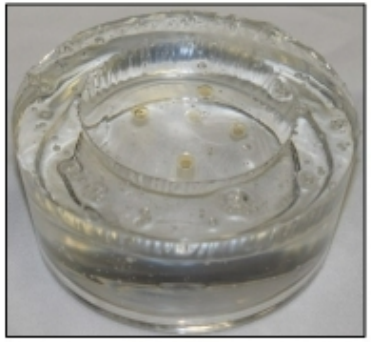
PDMS Layer
- Permeable to oxygen
- Contains bubbles of aqueous L-DOPA/KOH
- Inherently contains unique identifiers

Epoxy Layers
- Minimally permeable to oxygen
- Seals PDMS layer & O_2 sensitive L-DOPA
- Tampering allows oxygen to flow into and diffuse through PDMS
- Inherently contains unique identifiers

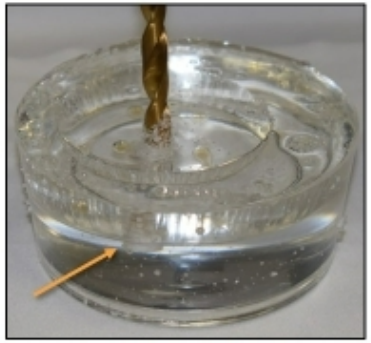
ACS Appl. Mater. *Interfaces*, **2016**, 8, 4314−4317

L-DOPA Tamper Event

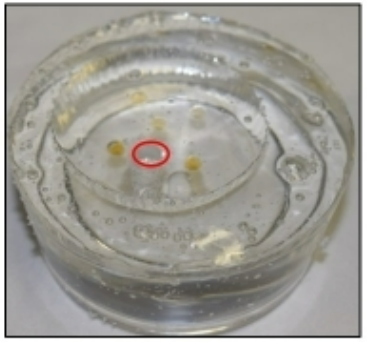
= tamper hole



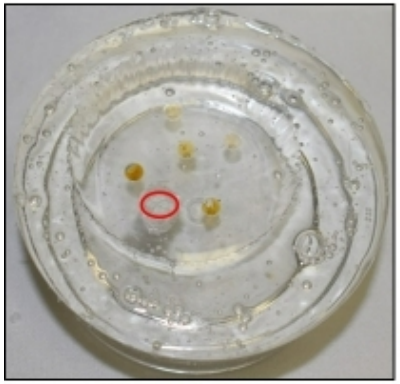
Before Tamper



Tamper event introducing oxygen

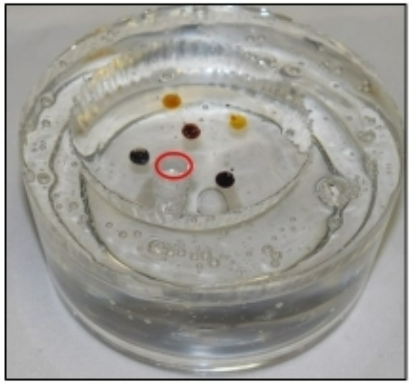


2 hours



4 hours

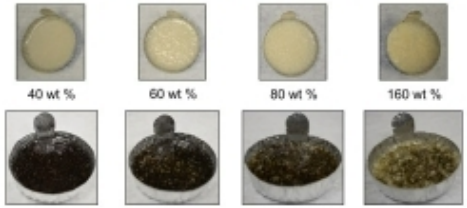
6 hours



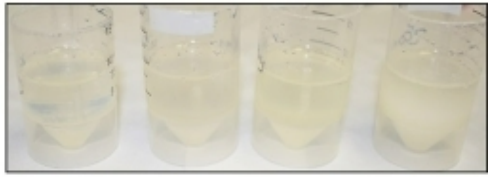
22 hours

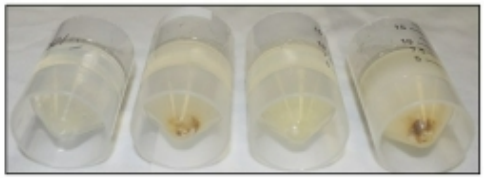
Process Improvements

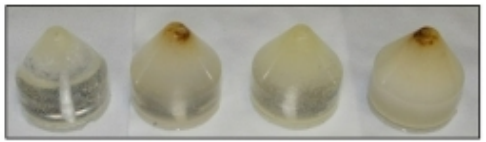
Polymer Substrate - Silicone



Polymer Substrate - Epoxy







High-boiling Polyprotic Organics

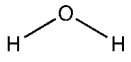
Water has temperature limitations that may not prove useful in all environments. Can we expand the temperature range of the sensing?

Using high-boiling polyprotic solvents rather than water was expected to allow both L-DOPA and KOH solubility while expanding the temperature range at which these materials can be utilized.

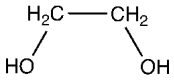
- To test this, water was replaced with;
  - Glycerol (T_b = 290 °C, T_f = 18 °C)
  - Propylene glycol (T_b = 187 °C, T_f = -60 °C)
  - Ethylene glycol (T_b = 197 °C, T_f = -13 °C)

T_b = Boiling point

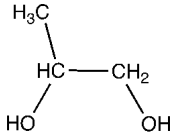
T_f = Freezing point



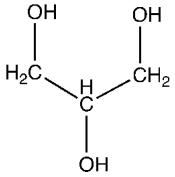
H_2O



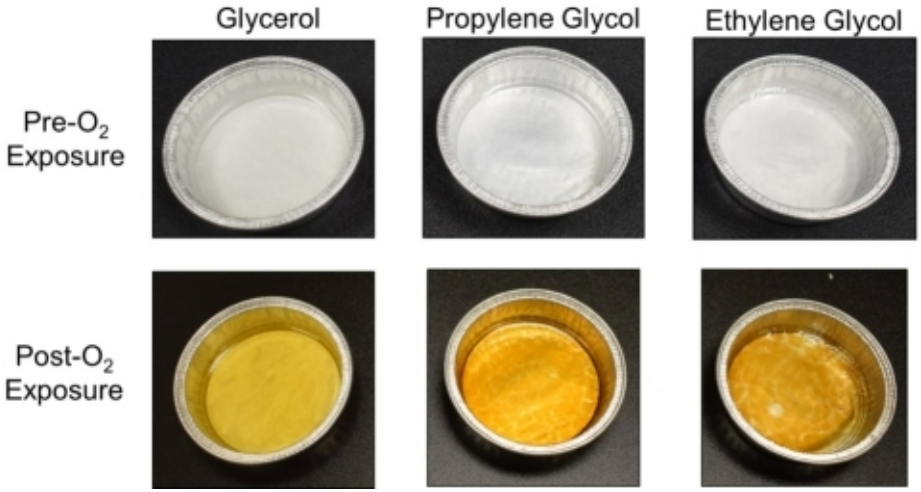
Ethylene Glycol



Propylene Glycol



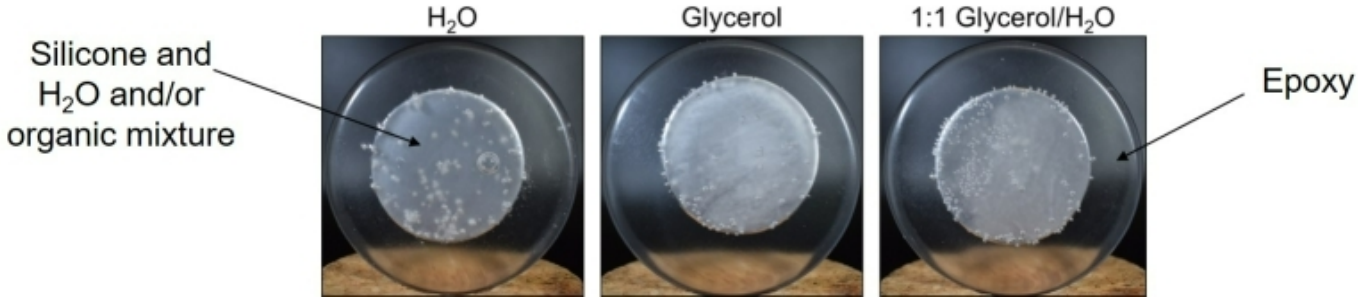
Glycerol



Balancing Solubility and Thermal Properties

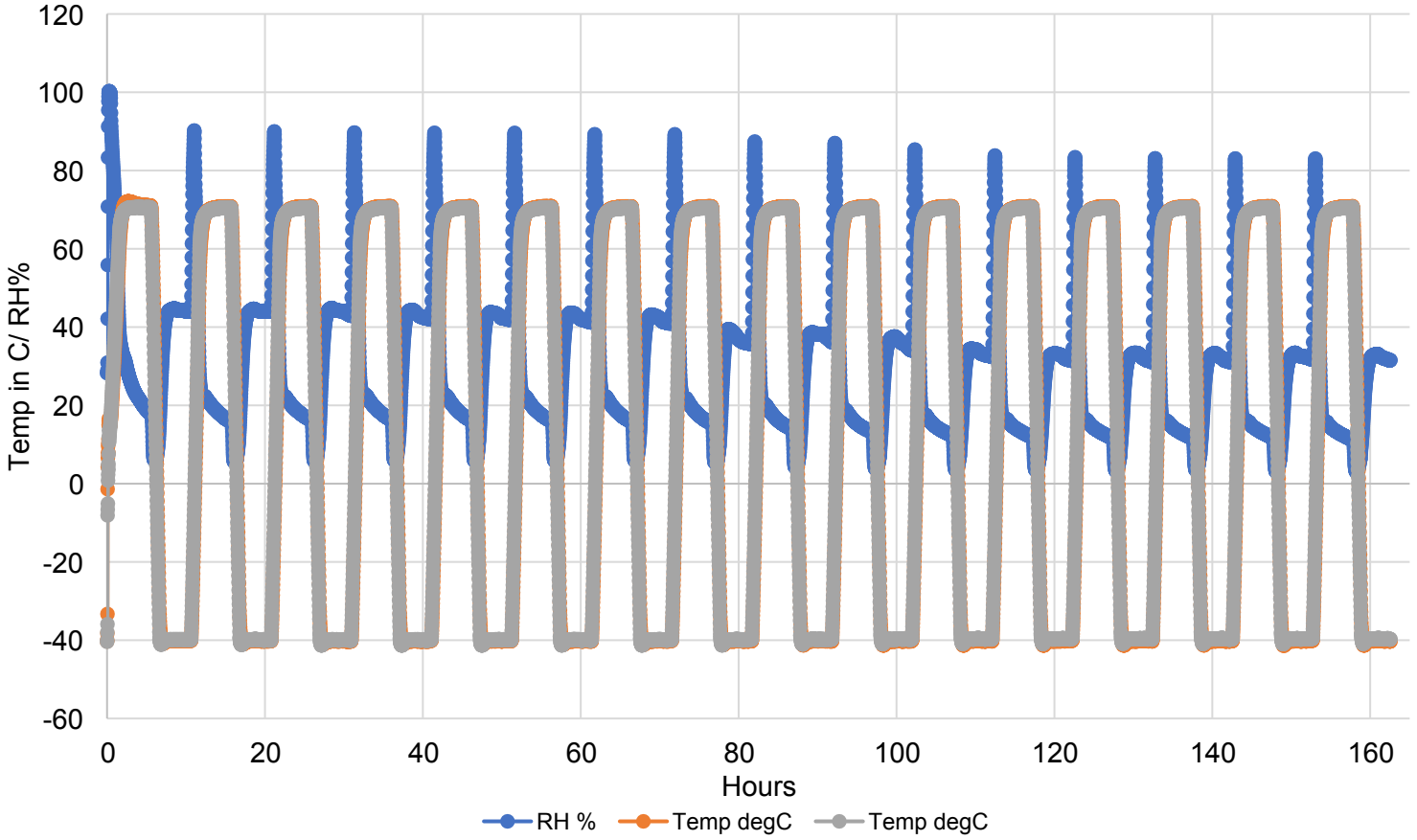
Once pure organic solvents were proven with the same O_2 mechanism established with H_2O, the final solvent experiments had relevant combinations of H_2O and polyprotic organics to yield a balance of solubility and thermal properties

Bubbles formed during processing lead to inherent areas that would be difficult to replicate for an adversary.

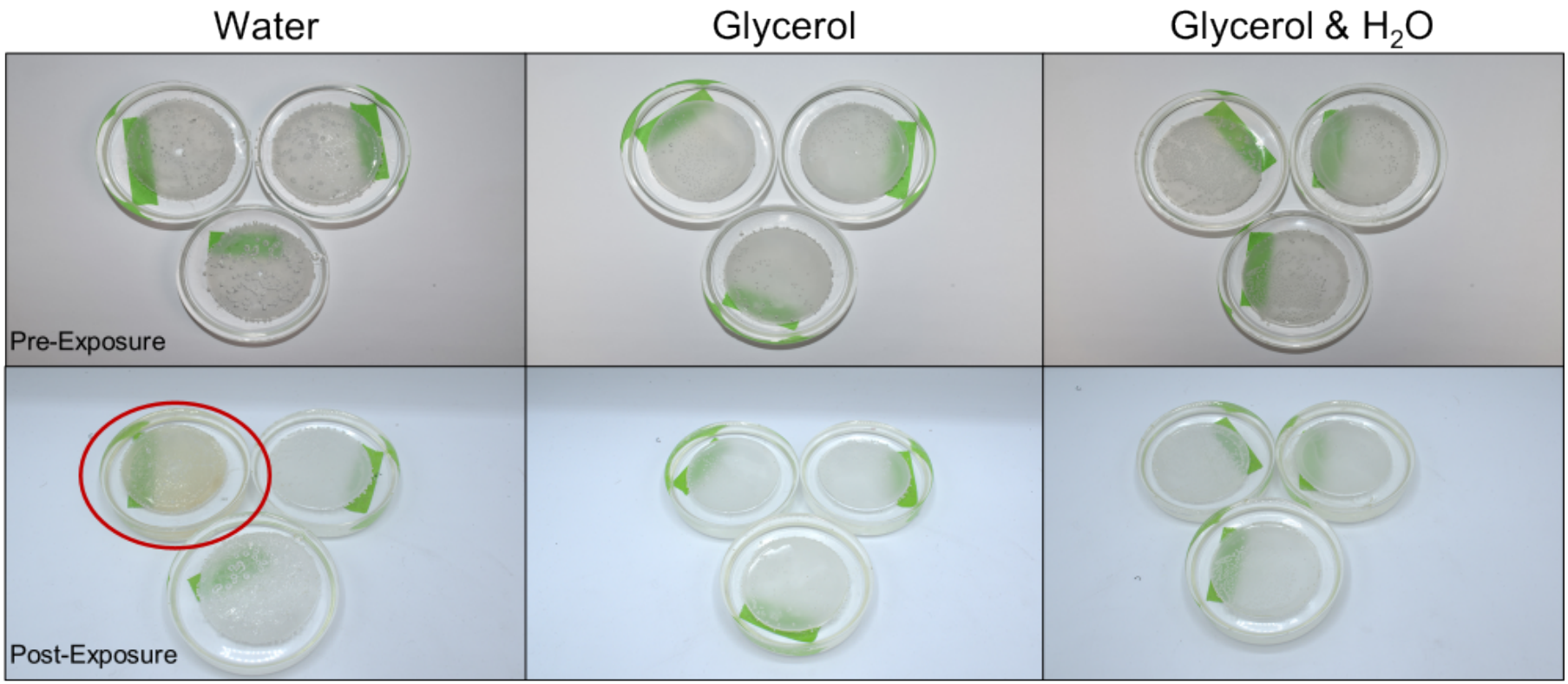


These coupons will be thermal cycled in a humidity chamber to determine 1) any chemical effects on the epoxy and 2) if increased O_2 diffusion due to in elevated temperatures leads to a false positive color change.

Environmental Testing of Puck Samples

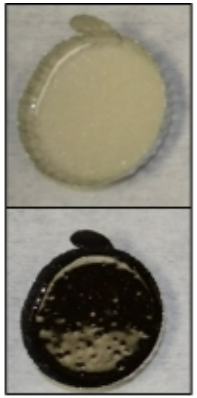


Pre & Post Thermal Cycling



L-DOPA Sensing Summary

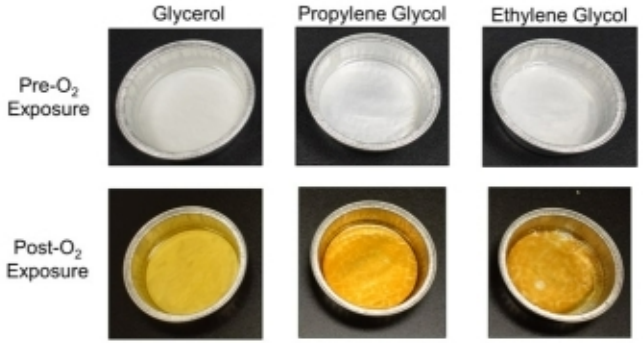
Sylgard & encapsulated in epoxy



NaPolyA & encapsulated in silicone

NaPolyA & encapsulated in epoxy

L-DOPA solution absorbed by beads & placed in Sylgard/Epoxy



Sustainable/Functional Epoxies through Boric Acid Templating

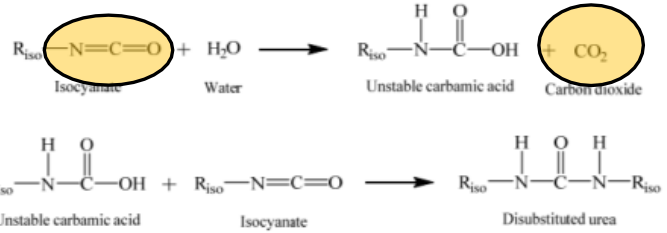
PRESENTED BY

Cody Corbin

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

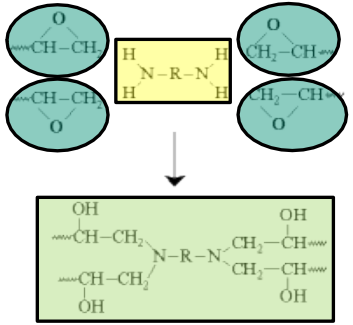
Background

Generic Polyurethane Foam Mechanism



Materials 2018, 11, 1841

Generic Epoxy Curing Mechanism



5 molecules yield 1

https://www.pslc.ws/macrog/lab/epoxy.htm

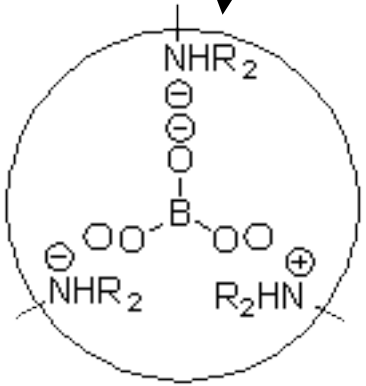
	Material Pros	Material Cons
Polyurethane Foam	High amount of crosslinking generates robust material Gas formation is always chemically favored leading to easy room temp cure	Starting isocyanate materials are highly toxic/reactive Greenhouse gas (CO_2) emitted during curing Functional groups present in final product are stable Very little ability to chemically modify anything for useful purposes
Epoxy	High amount of crosslinking generates robust material. All bonds present are strong. Potentially (but not always) cured at room temperature (no energy requirement)	Degradation/oxidation is slow over time due to the strength of the bonds formed. Environmental sustainability problem

These materials are used as adhesives, encapsulation and underfilling for electronic components, and as a matrix in composites for an assortment of application spaces. Bringing further functionality while balancing sustainability is important.

Novel material would contain the above pros and avoid, if not reverse, the cons. Thus, can a porous epoxy foam be created through judicious material design choices and some novel chemistry?

Concept

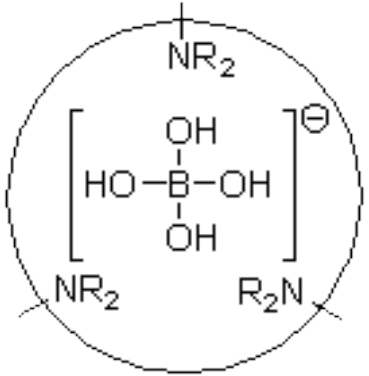
This mechanism to the right is primarily dependent on the ammonium borate complex below forming.



Borate-amine complex site

$+H_2O$

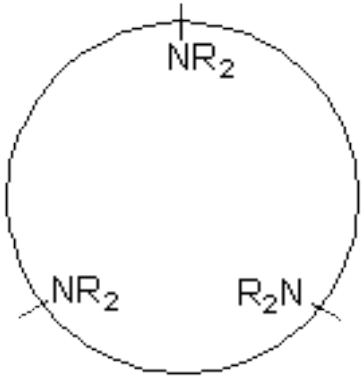
pH 7-9



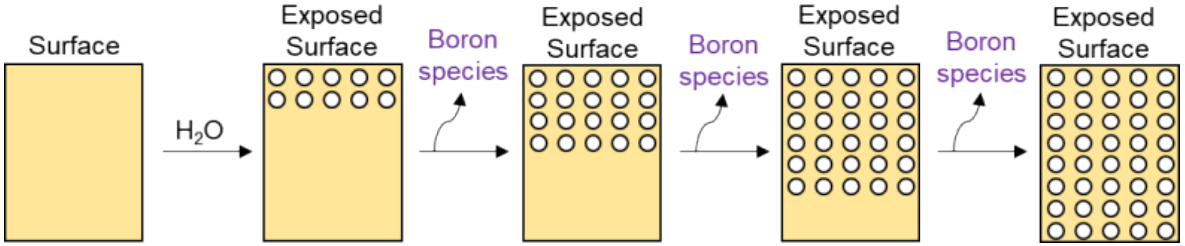
Water initiates borate solubilization

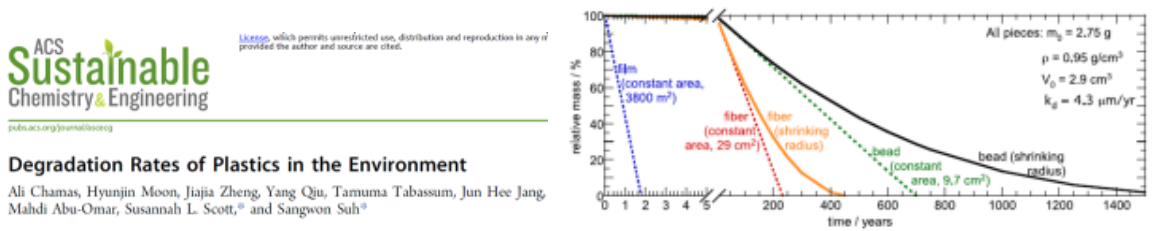
- $H[B(OH)_4]$

(Or other polyborate species)



Borate species dissociates out, leaving a porous, high surface area material





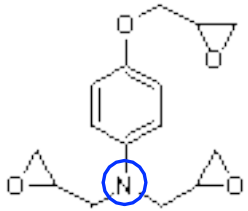
Inspiration

Previous work

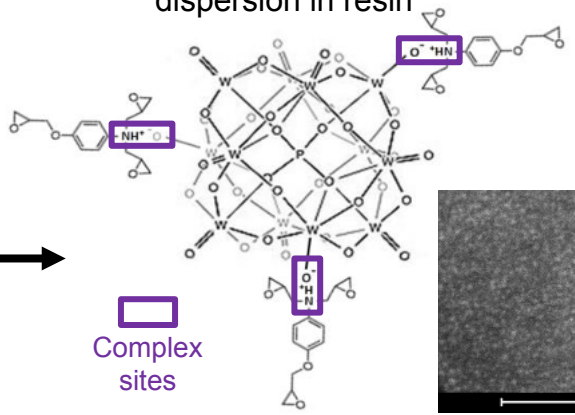
Phosphotungstic acid (PTA)
$[PW_{12}O_{47}(OH)_3]$ Acidic sites

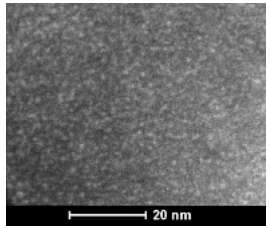
+

N,N-diglycidyl-4-glycidyloxyaniline



Formation of Epoxy-PTA complex drives dispersion in resin



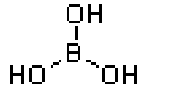


Monodisperse PTA

J of Polymer Science Part A: Polymer Chemistry, 50, 4507–4515, 2012

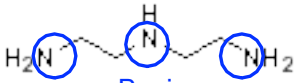
The proposed work

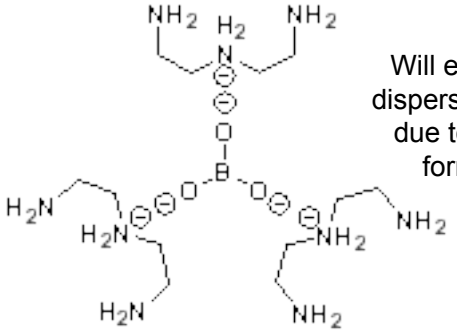
Boric acid
$B(OH)_3$ Acidic sites



+

Diethylenetriamine (DETA)

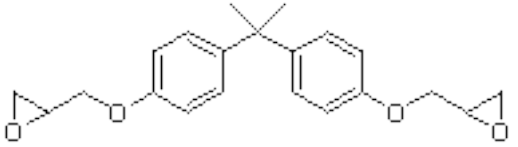




Will epoxy resin disperse boric acid due to complex formation?

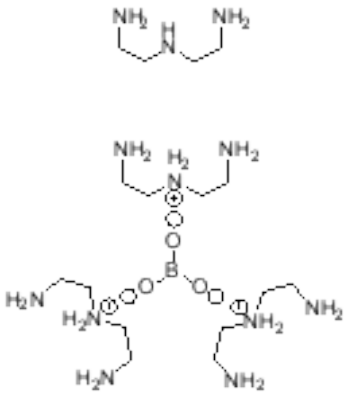
Initiated R&D Plan

EPON 828 Epoxy Resin
(Dyglycidal ether of BPA)

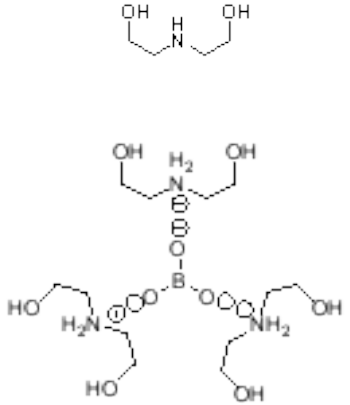


Composition focused on curing agents

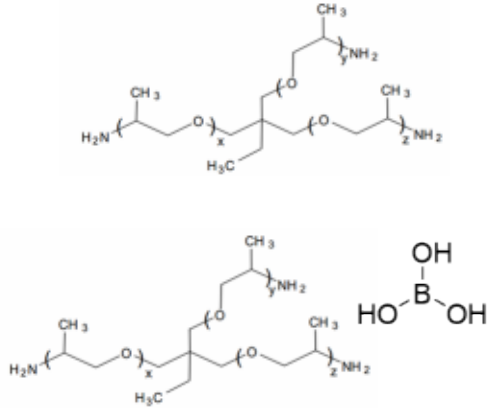
DETA

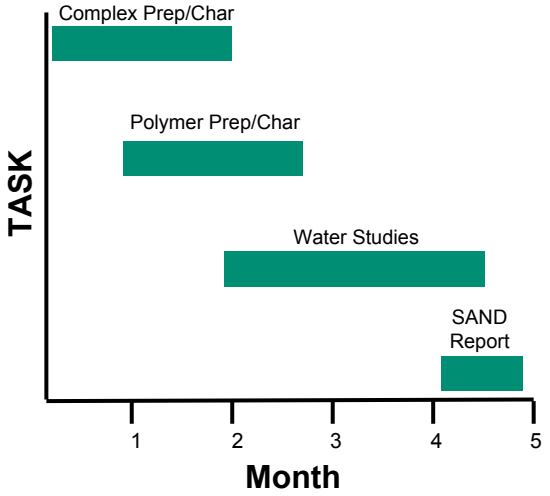


DEA



Jeffamine® T-403 Polyetheramine





Characterize complexes through ^{1}H NMR, ^{11}B NMR, FT-IR, Elemental analysis

Concentration

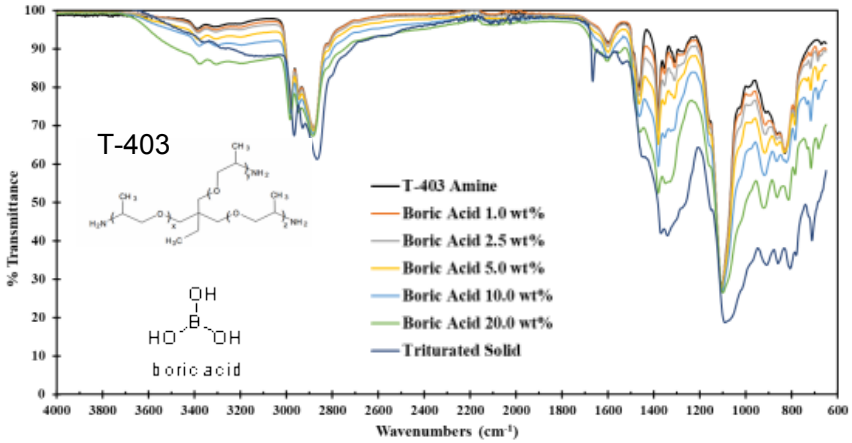
	1 vol %	2.5 vol %	5 vol %	10 vol %	20 vol %
Formulation 1					
Formulaiton 2					
Formulation 3					

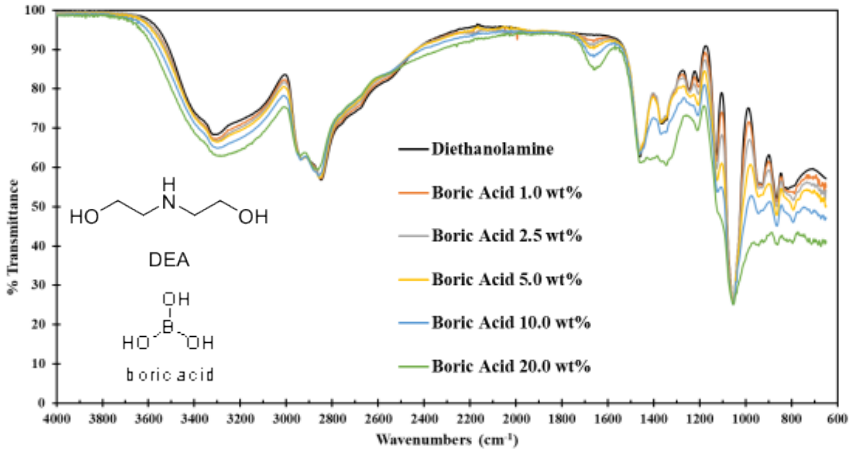
Characterize epoxy system through DSC, TGA, DMA

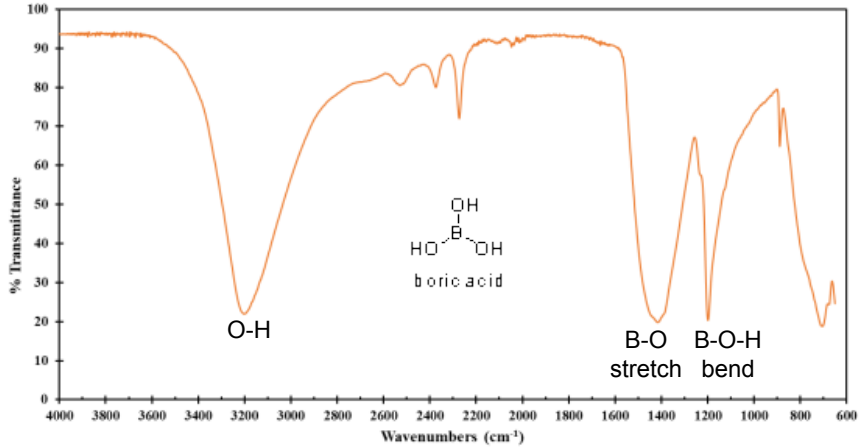
Technical risks

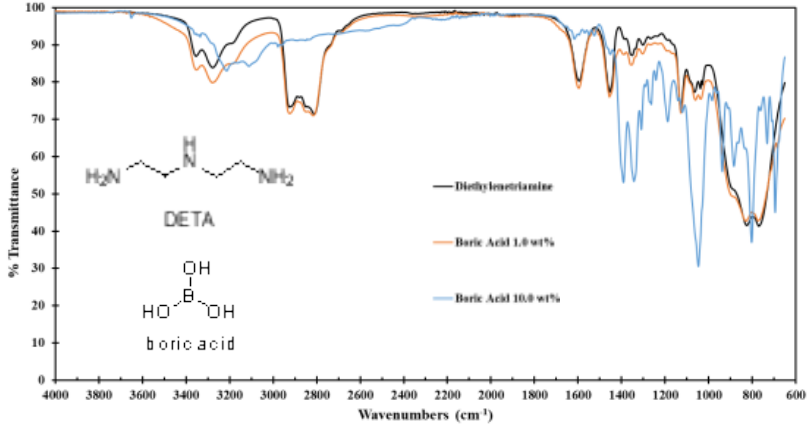
- $B(OH)_3$-amine complex does not form, yielding no permanent dispersion for cure & material testing.
  - Alternative amines will be used after evaluation of why complex did not form.
- $B(OH)_3$-amine complex formation negatively affects curing process/material property performance.
  - Concentration of $B(OH)_3$ in system will play a role here and a max quantity can be defined to ensure negative effects will be minimized.

FT-IR Data for Amine-$B(OH)_3$ Mixtures



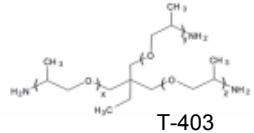






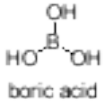
^{11}B NMR Data of Amine-$B(OH)_3$ Rxn Products

Precipitated Solid



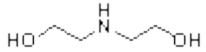
T-403

+



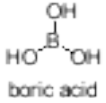
boric acid

Precipitated Solid



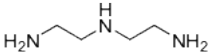
DEA

+



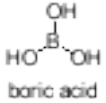
boric acid

Precipitated Solid



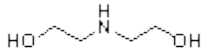
DETA

+



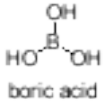
boric acid

Liquid Mixture



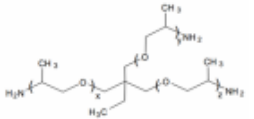
DEA

+



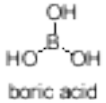
boric acid

Liquid Mixture

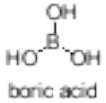


T-403

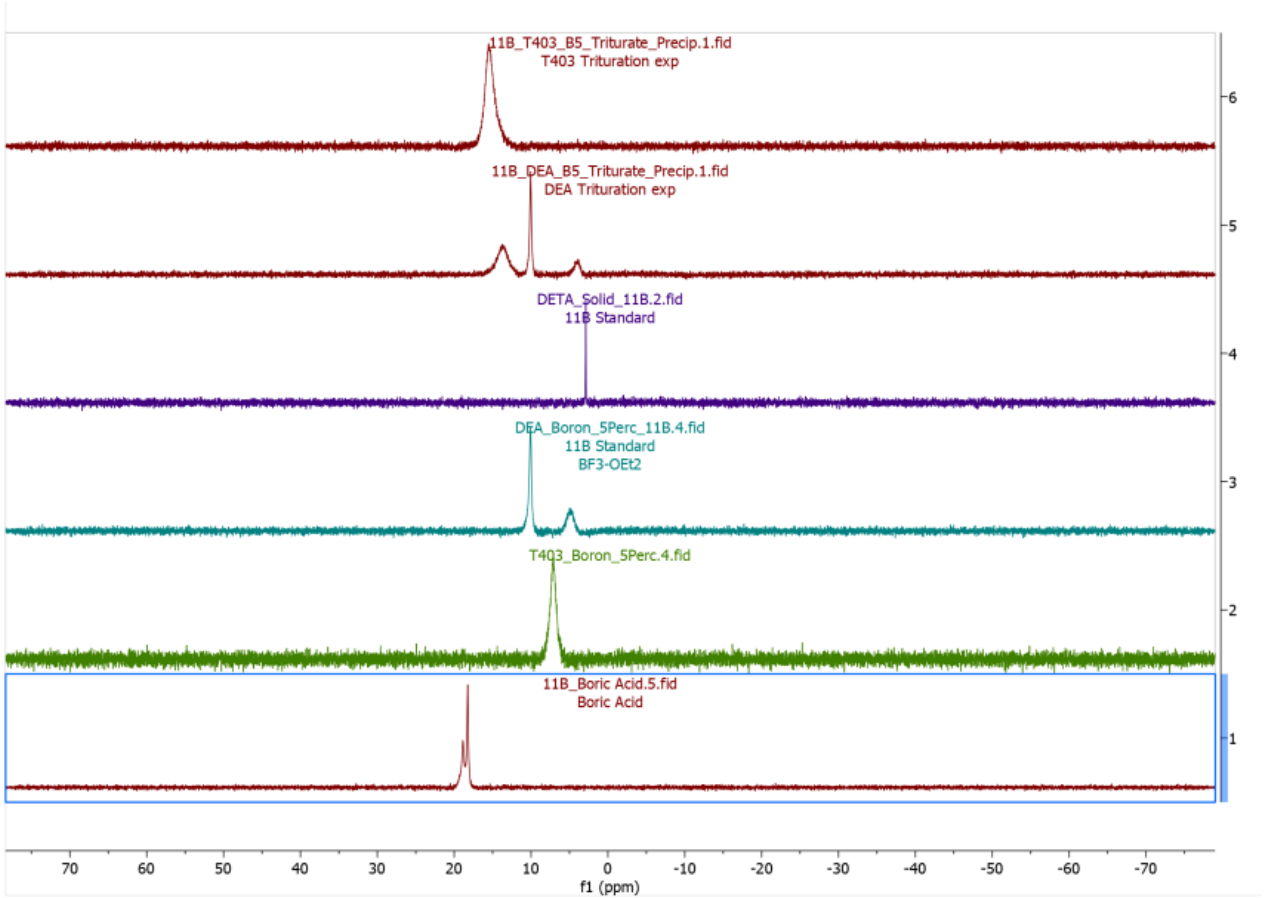
+



boric acid



boric acid

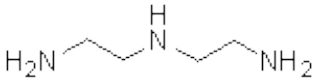


NMR solvent = CD_3OD

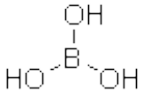
^{1}H NMR Data – DETA w/ $B(OH)_3$

Have crystals now, will attempt to get structure through SC-XRD.

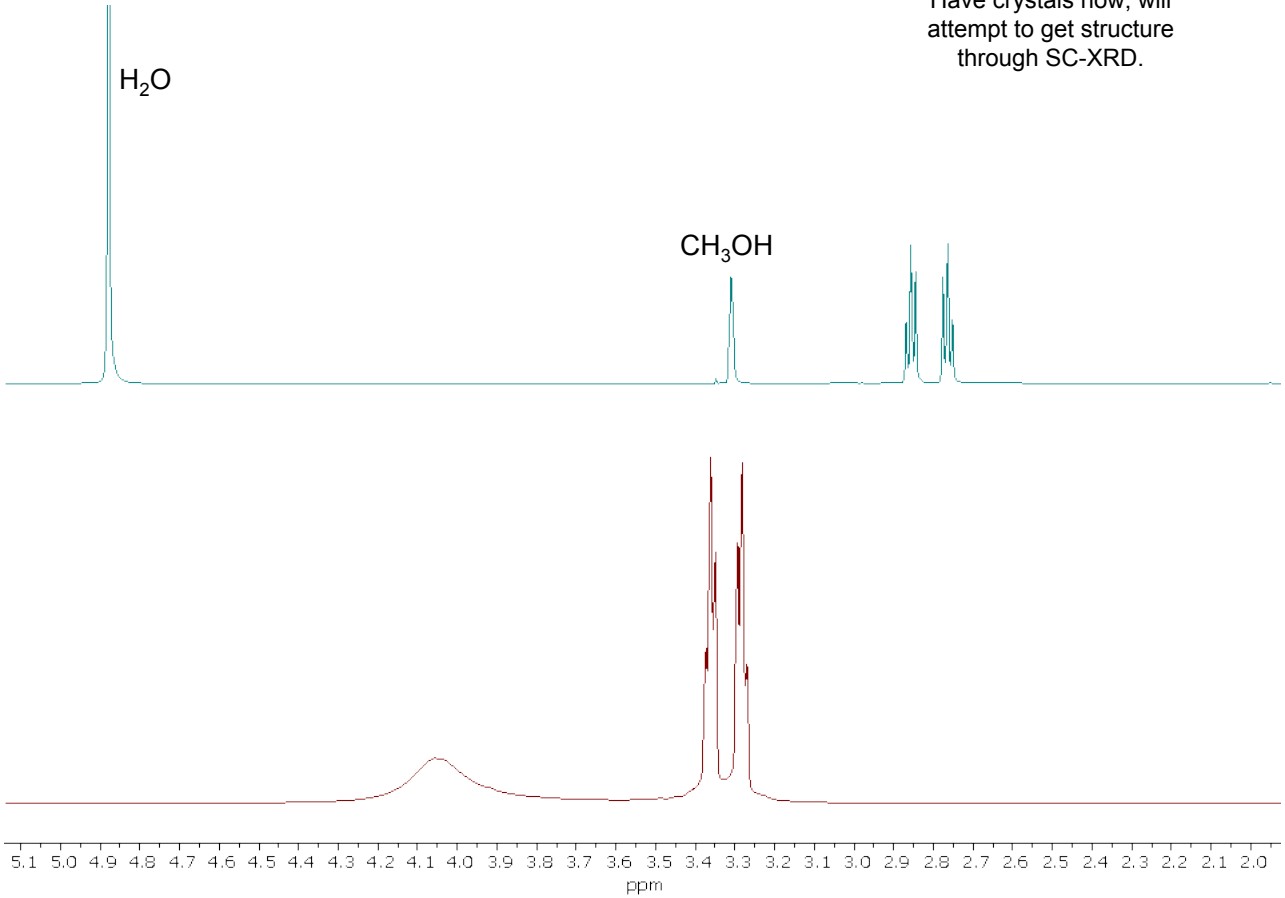
Precipitate

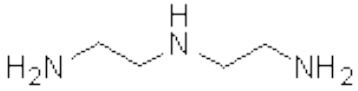


DETA



boric acid



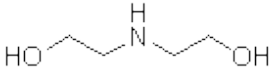


DETA

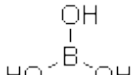
NMR solvent = CD_3OD

^{1}H NMR Data – DEA w/ $B(OH)_3$

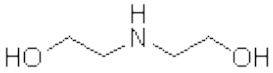
Precipitate



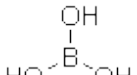
DEA



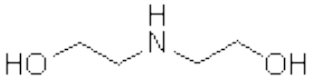
boric acid



DEA

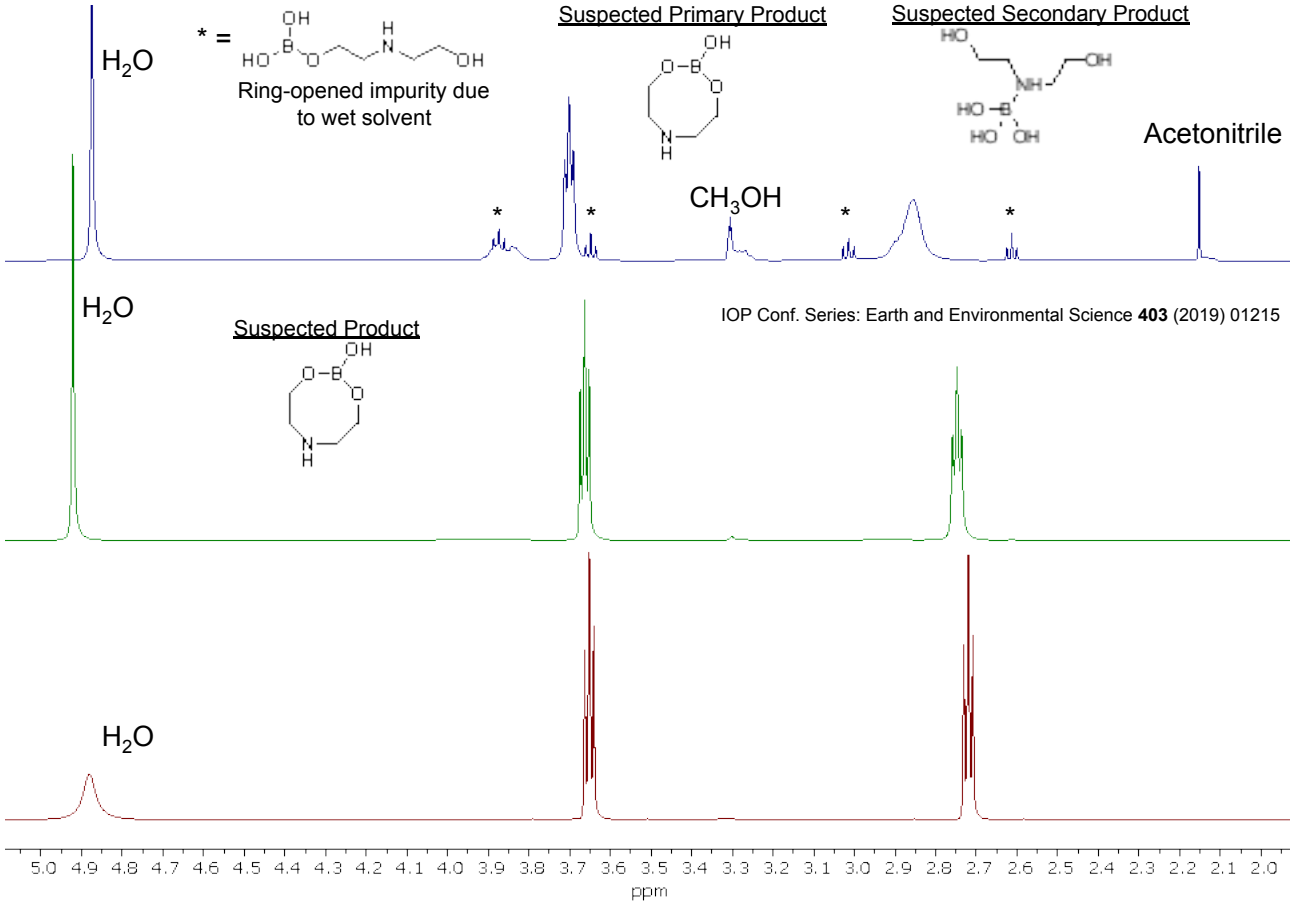


boric acid
5 wt%



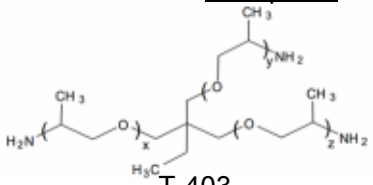
DEA

NMR solvent = CD_3OD

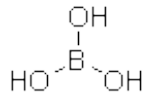


^{1}H NMR Data – T403 w/ $B(OH)_3$

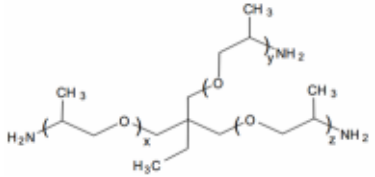
Precipitate



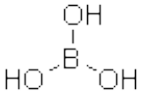
T-403



boric acid

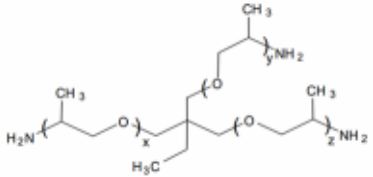


T-403



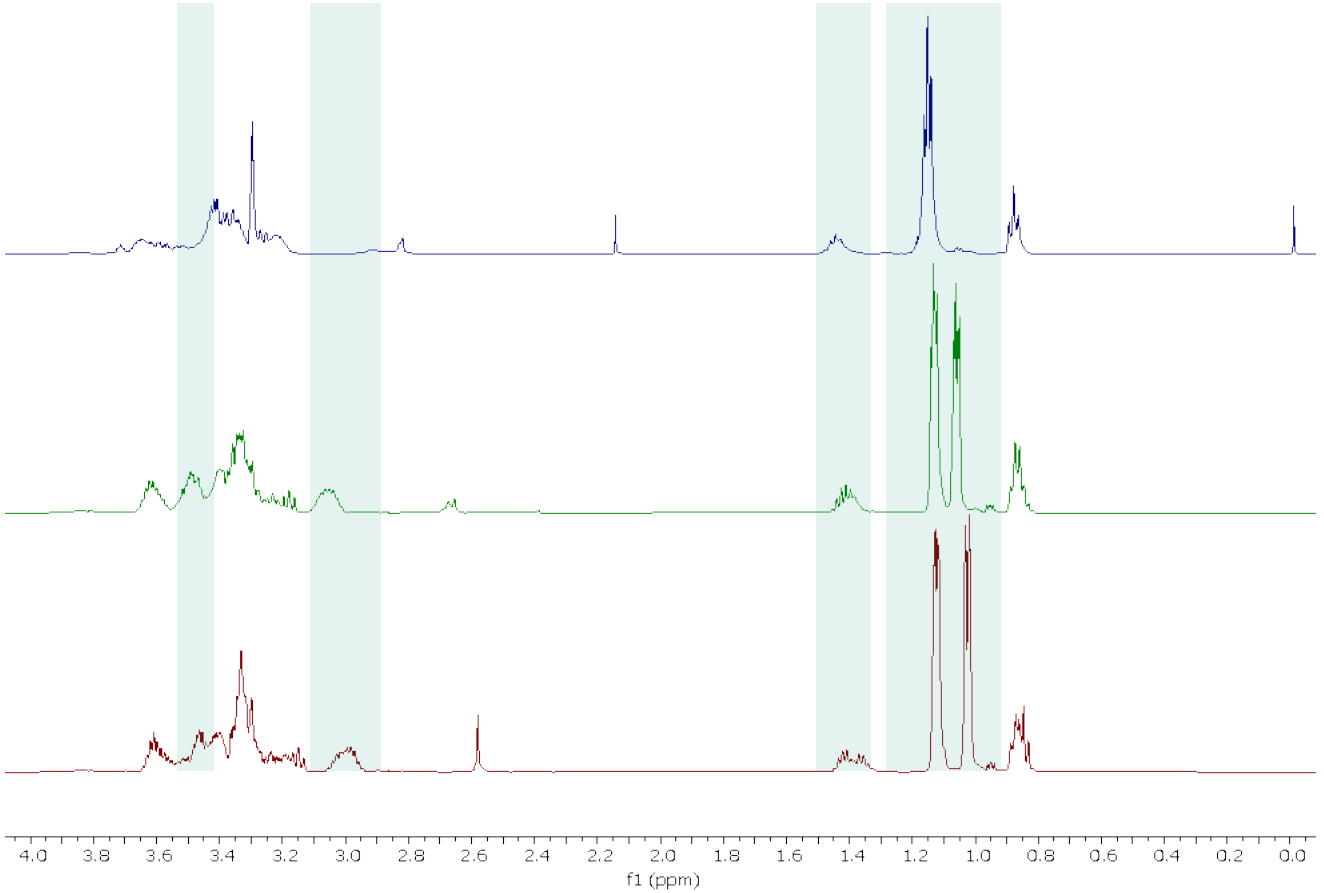
boric acid

5 wt%



T-403

NMR solvent = CD_3OD



UV-Vis Determination of DETA-B(OH)$_3$ Molecular weight

Journal of Molecular Structure 1095 (2015) 34–41

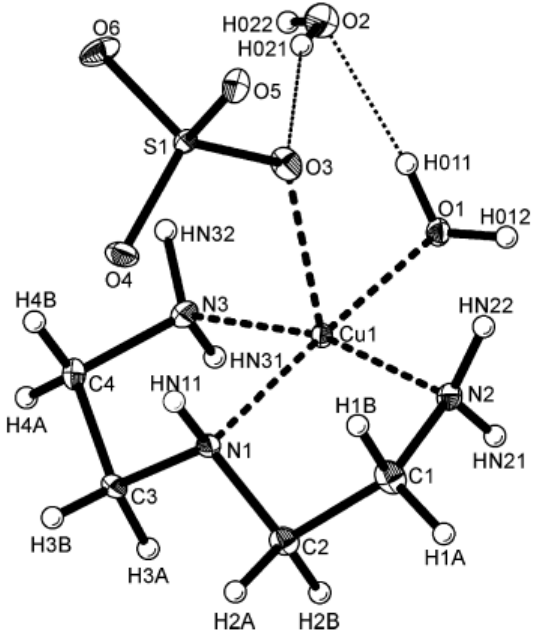
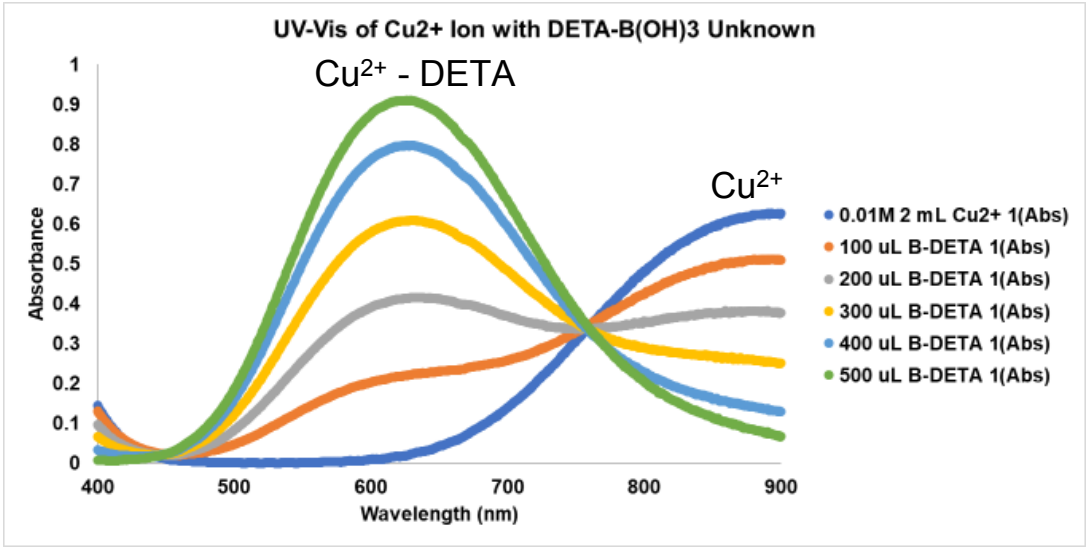


Fig. 3. Numbering system of the [Cu(*deta*)H$_2$O]SO$_4$·H$_2$O discrete unit in **1**. Thermal ellipsoids are shown with the 50% probability level for non-hydrogen atoms.

Since at least one of the Ns from DETA are chemically involved with the B, 2 equivalents of DETA-B are most likely possible.



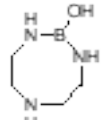
600 µL had lower absorbance, indicating no further reaction and dilution

2 mL of 0.01 M Cu^{2+} = 0.02 mmol Cu^{2+}

500-550 uL of 10 mg/mL unknown = 5-5.5 mg unknown

$$\frac{\text{5-5.5 mg}}{\text{0.04 mmol}} = \text{125-137 g/mol MW for unknown}$$

Suspected Product

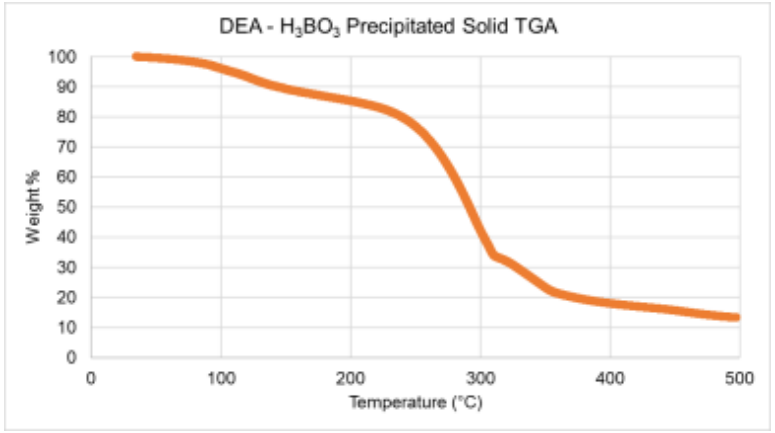


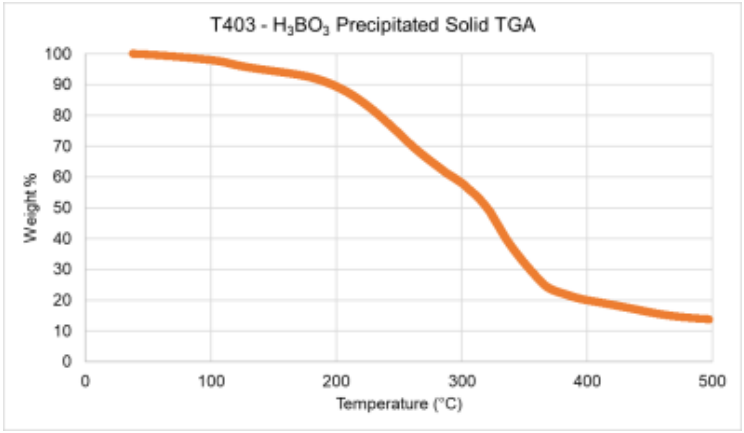
1,3,6,2-triazaborocan-2-ol

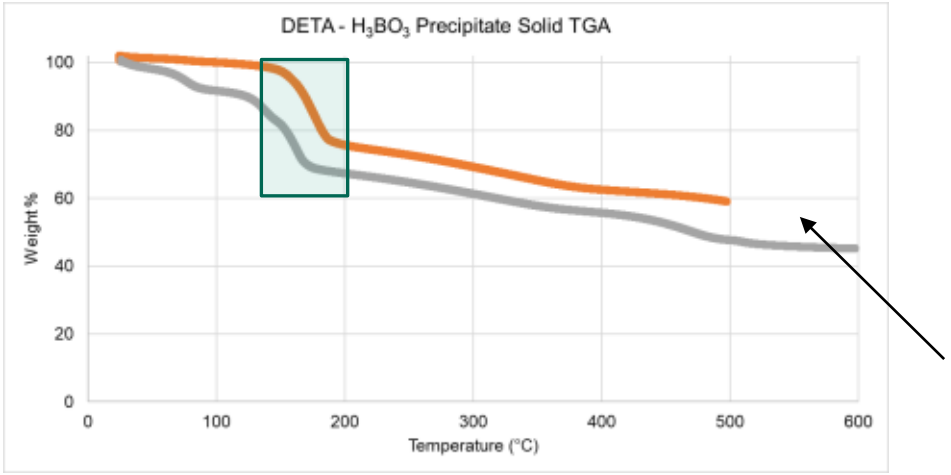
Chemical Formula: $C_4H_{12}BN_3O$

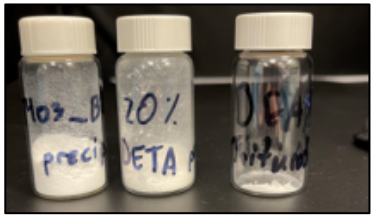
Molecular Weight: 128.97

Synthesized Amine-$B(OH)_3$ Compound TGA Data



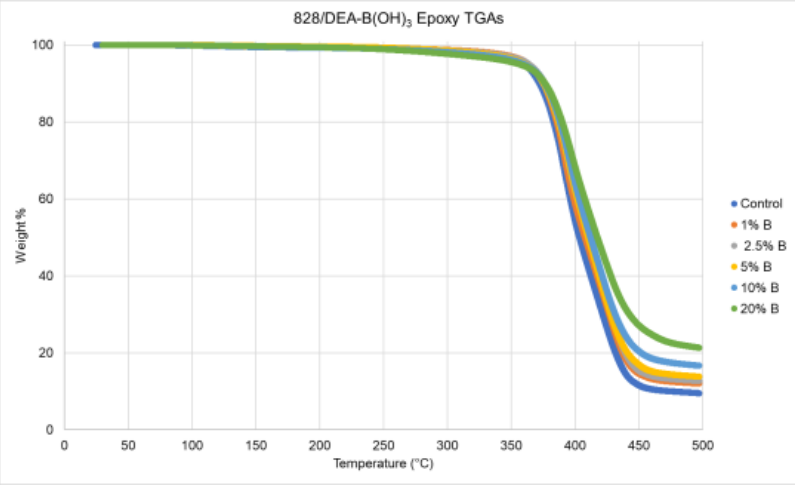


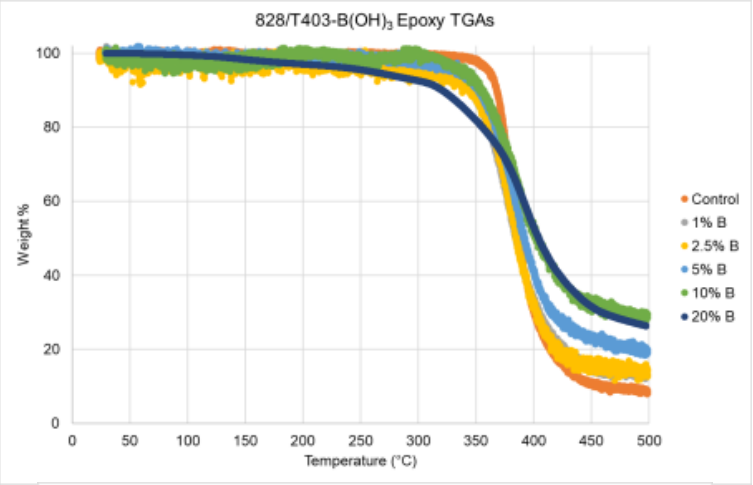




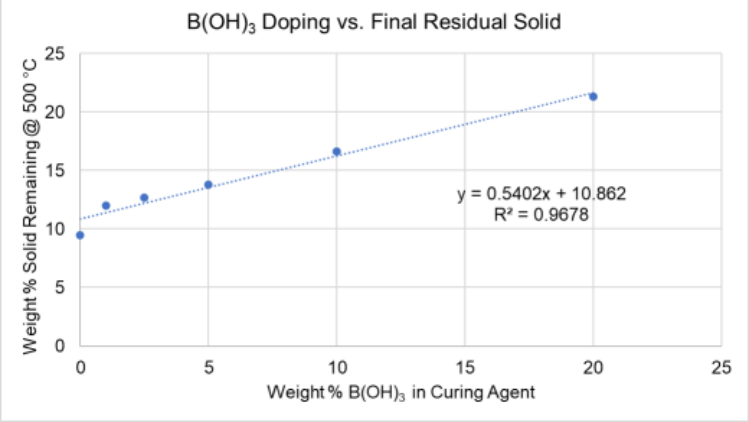
Very high weight % remains between 500 – 600 °C.

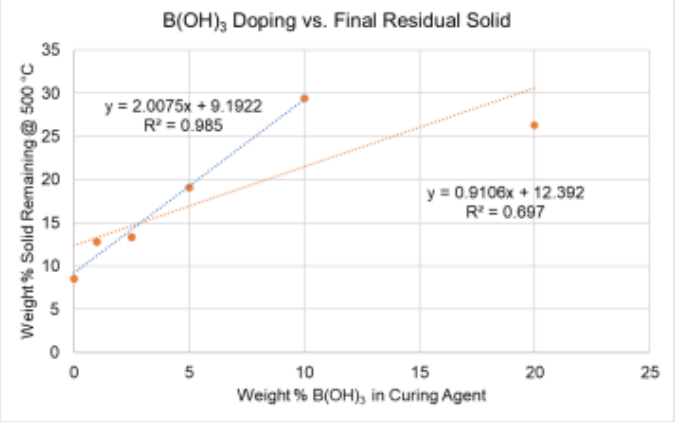
Amine-$B(OH)_3$ Epoxy TGA Data





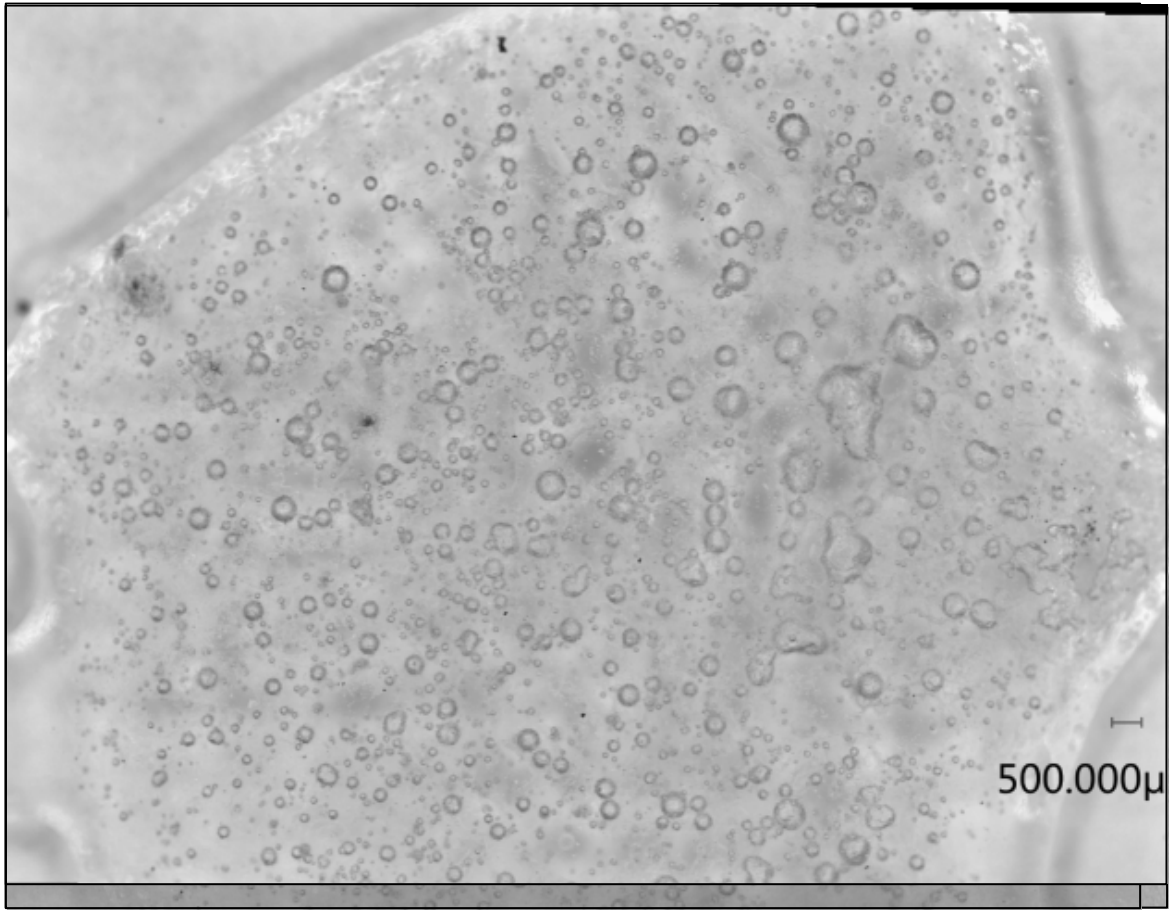
20% B potentially bad sample?





Optical Images of Water-Exposed 20% $B(OH)_3$ T-403 Epoxies

H_2O
pH = 9

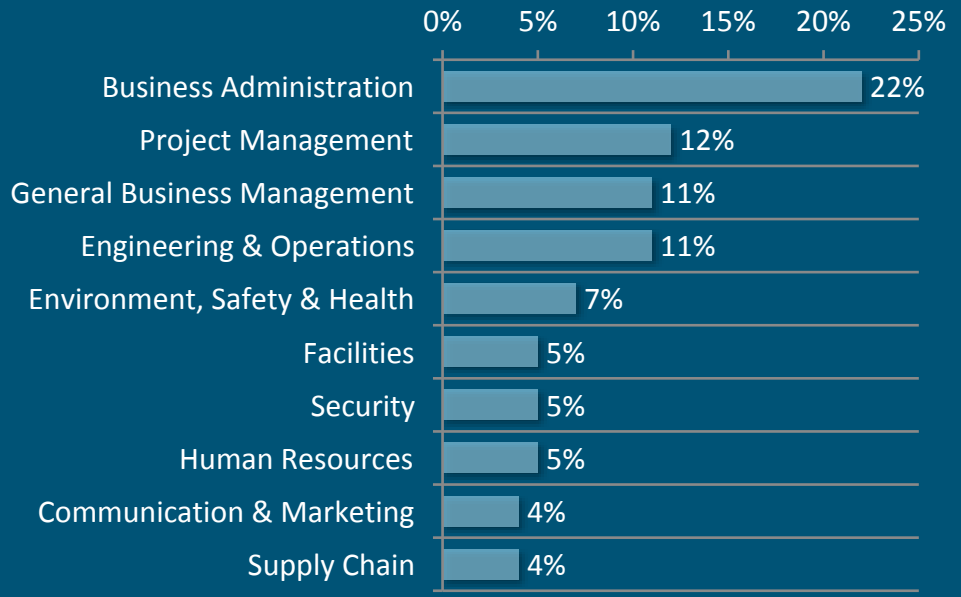


THANK YOU

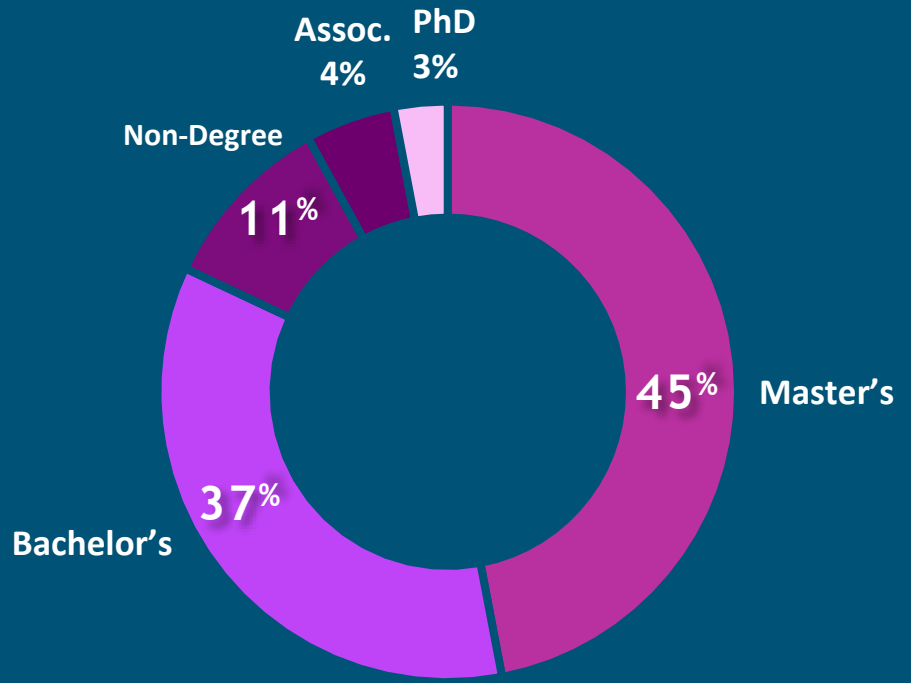
Yello Event QR Code Above
Submit your resume/CV!

Backup Slides

Business & Operations Staff



Top 10 job families shown , Regular exempt non-management employees only



Degree levels for all our
non-management professions including those not represented

Data as of July 2021

The Work Experience

- Have meaningful & challenging work assignments
- Work in state-of-the-art research facilities
  Take a Virtual Tour @ tours.sandia.gov
- Work with top minds
- Join outreach and networking groups
- Receive award recognitions,
  like R&D 100 Awards *and more*
- Take a leave to pursue qualifying research and professional opportunities
- Receive patent royalties, if eligible
- Experience a career path in various areas at Sandia
- Check out Sandia's Lab Accomplishments!

Our Culture – Our Values

- We serve the nation
- We respect each other
- We act with integrity
- We deliver with excellence
- We team for great results

Our Culture – Giving Back

Sandia invests in the areas of Family Stability and Educational Success, recognizing that both are critical to a thriving community.
Here are a few areas where Sandians have given back:

Donations

- COVID-19 Relief Aid, Employee contributions & drives
  - $245k to Native American Communities, New Mexico
  - $100k to Roadrunner Food Bank, New Mexico
  - $20k for United Way Bay Area, California
- United Way - contributing $1.8 million a year
- Other nonprofits in New Mexico, California and the nation - contributing $2.5 million a year

Volunteering

- K-12 STEM education outreach
- Help at food banks
- Animal Adopt-a-thons
- Coach sports teams
- Lead scouting troops
- Build homes

Education and Mentoring

In-house Education, Training and Mentoring Programs

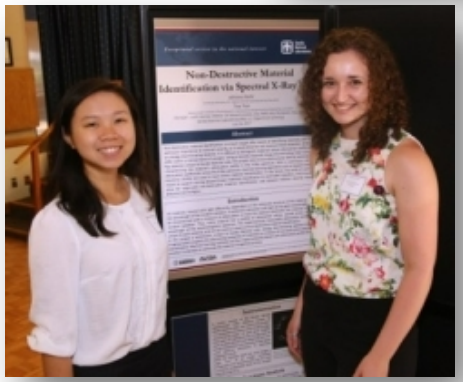
- Business
- Communication
- Design and drafting
- Energy
- Health and wellness
- Information technology
- Manufacturing
- Marketing
- Project management
- Sciences

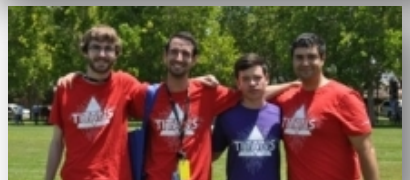
Outreach & Networking Groups

- Abilities Champions of Sandia
- Advancing the Next Generation of Leadership Excellence (ANGLE)
- American Indian Outreach Committee
- Asian Leadership & Outreach Committee
- Black Leadership Committee
- Hispanic Outreach for Leadership Awareness
- Military Support Committee
- Sandia Parents Group
- Sandia Pride Alliance Network
- Sandia Women's Action Network
- *And many other employee engagement groups!*

Internships – Outreach & Networking Events

- Summer Welcome Event
- Intern Career Fair
- Intern Symposium
- Facility Tours
- Speaker Forums
- Professional Development Classes





Institute Internships

Institute Programs Website

- Computer Science Research Institute (CSRI)
- Energy Surety Incubator (ESI)
- Interdisciplinary Design, Engineering, and Assurance Students (IDEAS)
- Interns for Security, Arms Control, and Force Protection Engineering (iSAFE)
- Mission Services Talent Acquisition Team (MSTAT)
- Monitoring Systems and Technology Intern Center (MSTIC)
- Nonlinear Mechanics and Dynamics (NOMAD)
- Nuclear Weapons Summer Product Realization Institute (NWSPRINT)
- Research and Applications of Mechanics of Structures (RAMS)
- Science of Extreme Environments Research Institute (SEERI)
- Resilient Energy Systems Intern Institute (RESII)
- Future of Research for Climate, Earth, and Energy (FORCEE)
- TITANS:
    - AutonomyNM
    - Cybersecurity
    - Math and Analytics
    - Software Engineering

Sandia California - *Livermore*

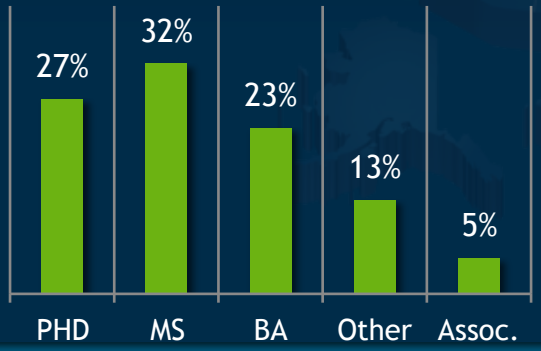
On-site workforce: **~1,800**

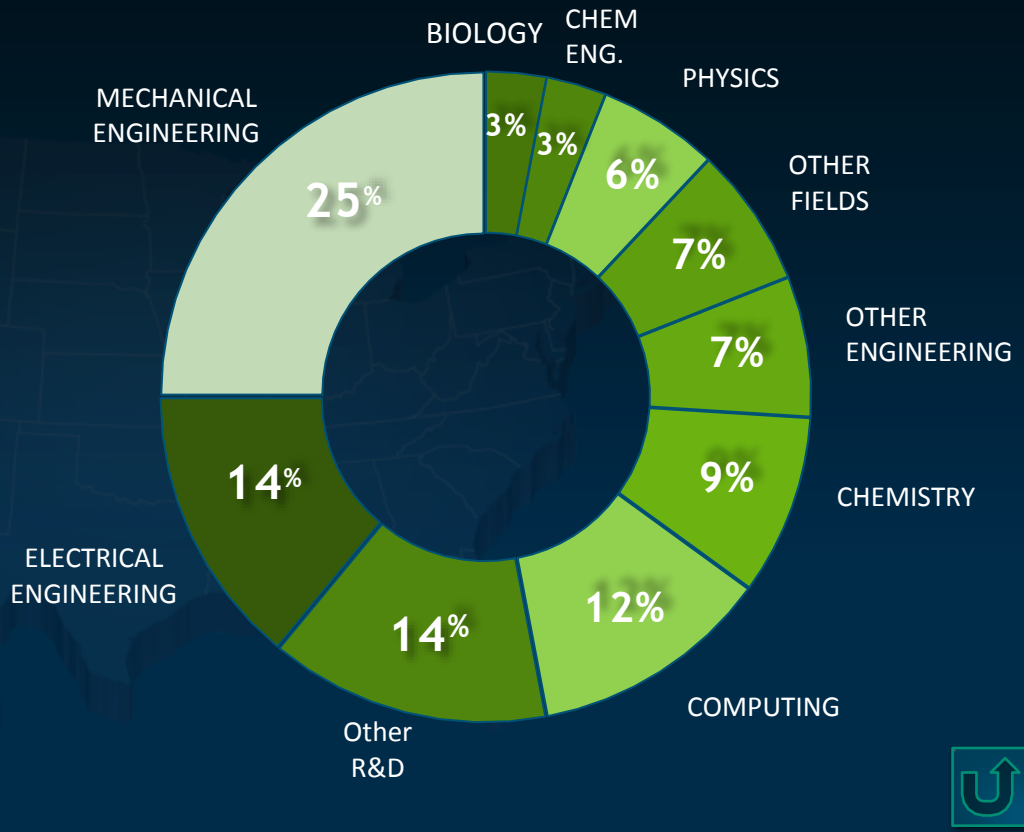
R&D staff & technologists: **~940**

Distinguishing research capabilities:

- Applied Biosciences
- Combustion Research
- Information Systems
- Micro & Nano Technologies and *more*

Degree Level





Data as of July 2021

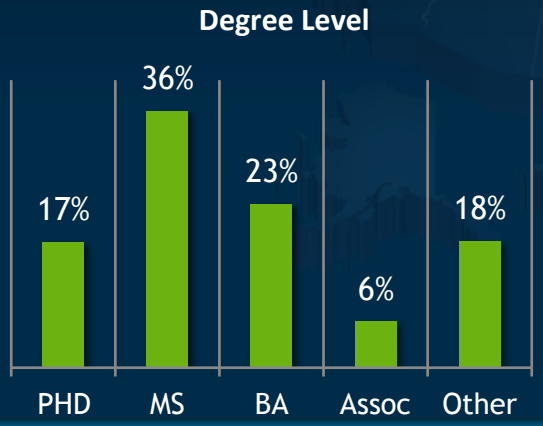
Sandia New Mexico - *Albuquerque*

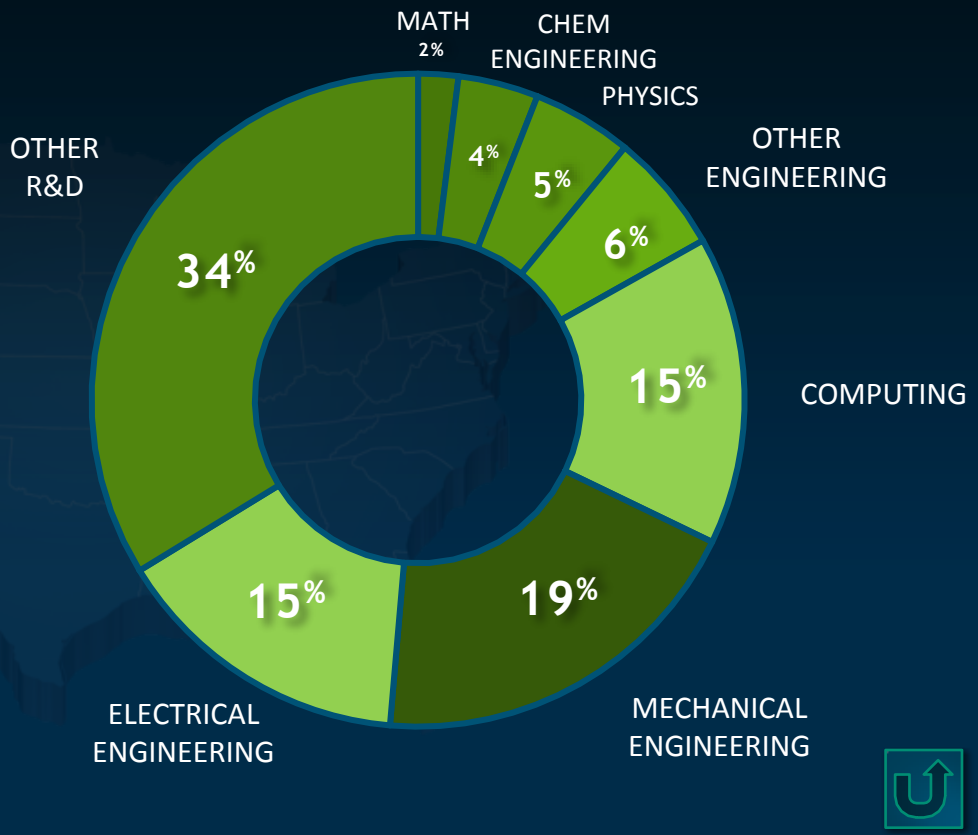
On-site workforce: **~13,200**

R&D staff & technologists: **~6,700**

Distinguishing research capabilities:

- Cybersecurity
- Renewable Energy
- Micro-electronics/Semiconductors
- Homeland Security *and more*





Data as of July 2021

Sandia's Brand Promise - *Sandia's Employee Value Proposition*

- ***National Security Mission:***
  Your work contributes to the security, peace and freedom of our nation and the world
- ***Uniquely Challenging and Important Work:***
  The work you do will be challenging, and amazing with real-world impact
- ***Work with Great People:***
  You will work with extraordinary people, the top minds in their field
- ***Research Facilities Like None Other:***
  You will have access to some of the best tools, equipment, and research facilities in the world
- ***Healthy Lifestyle, Work-Life Balance:***
  You will experience a balance between your work life and personal life through flexible schedules, competitive benefits, and convenient amenities
- ***Career Mobility:***
  You can have a full-life career at Sandia by working across multiple projects and areas of your interest

Employer Awards

- Forbes America's Best Large Employers 2021
- Forbes Best Employer for Diversity 2019
- Fairygodboss Best Company &
  Top Rated CEO 2020
- "Top 20 Government Employers" Equal Opportunity Readers Choice 2021 – Ranked #16
- "Top 20 Government Employers" Careers & disabled Readers Choice 2021 – Ranked #11
- Minority Engineer Magazine – Ranked #12 in 2021
- "Top 50 Workplace" for Indigenous STEM professionals by American Indian Science and Engineering Society
- Black EOE Journal – Best of the Best

Available Videos

Videos require wifi in order to play

Sandia Videos
Sandia Mission Video (4:36)
Sandia Our Roots (3:05)
Sandia Life (2:44)

Intern Videos
2019 Sandia Student Symposium(2:43)
Sandia's Center for Cyber Defenders(2:59)
Internships at Sandia Labs(19 Videos)

Location Videos
Sandia New Mexico Location (3:23)
Sandia California Location (3:41)

Diversity & Inclusion Videos
Abilities Champions of Sandia
American Indian Outreach
Asian Leadership Outreach
Black Leadership Outreach
Employee Resource Groups
Exceptional Warrior Video
Hispanic Leadership Outreach
Sandia Women's Action Network
Sandia Pride Alliance Network

*For more Sandia Videos refer to Sandia's YouTube Channel

For dowloadable video files, visit our Video library