Center for Additive Manufacture of Advanced Ceramics *(CAMAC)*

May 31st, 2022

https://camac.charlotte.edu/

Materials → Process → Post-Process

THE WILLIAM STATES LEE COLLEGE OF ENGINEERING
CHARLOTTE
NC STATE UNIVERSITY
THE UNIVERSITY OF NORTH CAROLINA SYSTEM

The Team

Brigid Mullany
- Professor
- Associate Dean for Research
- MEES, UNCC

Steve Schmid
- Professor
- Belk- Woodward Distinguished Professor
- MEES, UNCC

Cheryl Xu
- Associate Professor
- M&A, NC State

Ahmed El-Ghannam
- Professor
- MEES, UNCC

Wes Williams
- Associate Professor
- ETCM,UNCC

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Mission

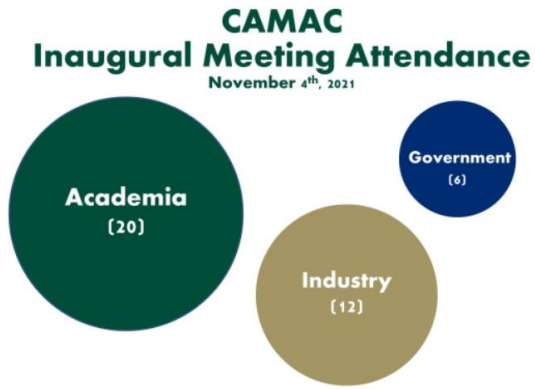
- CAMAC Community building
  - Networking
  - Seed funding
  - Travel grants https://camac.charlotte.edu/funding-opportunities
  - Bi-Annual meetings

- CAMAC Infrastructure
  - Equipment updates to follow
  - **Proposals submitted –** DoD's Research and Education Program for Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI) Equipment/ Instrumentation for Fiscal Year 2022.
  - …

- CAMAC Sustainability
  - Go beyond ROI grant life span…

Last meeting summary

- 1st Meeting was Nov 4th, 2021
  - Zoom meeting
  - ~40 attendees



- Seed funding
  - 7 proposals – reviewed by National Lab Members and CAMAC team (thanks!)
  - 4 highly ranked
    - **Discrete Element Method Analysis of Ceramic Powders for Advanced Manufacturing** - Taher Abu-Ledbeh (NC A&T)
    - **3D printing/Additive manufacturing of photocurable silicone carbide-polymer composite with densified microstructures** - Erina Baynojir Joyee & Ahmed El-Ghannam (UNCC)
    - **Stereolithography of Silicon Carbide** - Steve Schmid & Brigid Mullany (UNCC)
    - **Spatial Analysis of Additively Manufactured Ceramic Surfaces** - Brigid Mullany (UNCC)

Students involved in the projects

Safwat Shenouda	PhD	NC A&T
Towniq Raham	PhD	UNCC
Taylor Barret-Crvich	PhD	UNCC
Tien Herd	MSc	UNCC
Aaron Macri	Ugrad	UNCC
John Friday	Ugrad	UNCC
Khayzaran Qubbaj	Ugrad	UNCC
Obyda Marzouk	Ugrad	UNCC

Travel Grants

Application and selection process

At least **3 weeks before the planned travel,** send a one-page document detailing the trip and reason etc. to bamullan@uncc.edu

- More details can be found via https://camac.charlotte.edu/
- Applications can be submitted at any time and are subject to availability of funds.

Deliverables:

Upon return from travel, **a brief report of the activities must accompany the submission of the travel receipts**.

Approx. $20,000 is available this new academic year.

Lab Reorg. & Equipment Purchases

Budget breakdown

- $250,000 Year 1
- $500,000 Year 2
- $500,000 Year 3

Labs being reorganized

Equipment purchased

- Furnace
- Healthy supply of slurries on order
- Printer DLP: Bison
- Printer SLA: 3DCeram + Auxiliary

SentroTech: ST-1800C-445 High Temperature Box Furnace

- Max. Continuous Operating Temperature: 1800 °C
- Heating Chamber Size - 4"W x 4"H x 5"D
- Controller: Eurotherm Nanodac (100 programs, 20 segments /program)
- Heating Element Size - 6/12
- Power: 3 KW
- Voltage: 208/240 V – Single Phase
- Thermocouple: Pt20Rh/Pt40Rh, (Platinum - Rhodium)
- Exhaust port
- N2/Ar purge kit

Range of Slurries - 3DCeram system

- ## Zicronia

ZrO_2, material with the very good mechanical properties cold, being able to be colored for applications in jewelry, excellent mechanical properties in the high temperatures, the weak thermal conductivity at room temperature, conductor in T> 1000°C, great hardness, good wear resistance, good chemical slowness, good resistance in the attacks of metals.

- ## Alumina Oxide

Al_2O_3, basic material being useful in many applications for technical ceramics, good mechanical behavior in the high temperatures, the good thermal conductivity, the big electric resistivity, the great hardness, the good wear resistance, the chemical slowness.

- ## SiCore

Silicore is a ceramic formulation specifically developed for foundry cores. It is formulated on a silica basis and has a high mechanical resistance. It is a porous ceramic enhanced the leachability even when it comes to complex shapes.

Seed Funding

- Next round of proposals to be approved early August start… start thinking
  - Equipment updates – **what can you use?**
  - Materials available to you - **have an application in mind?**
  - Lightning talks – **can you find new potential partners?**
  - Tour around Duke – **does it spark any ideas?**
- Written proposals to be submitted July 11th
- Idea presentation **on Tuesday July 26th** (Zoom event)
- Notification – Early August.
- Details can be found here - https://camac.charlotte.edu/funding-opportunities

CAMAC | Center for Additive Manufacture of Advanced Ceramics

Agenda- *May 31st 2022*

May 31st EST	Zoom: ***https://uncc.zoom.us/j/96859050279?pwd=SEN0TTF3Y1RlUEN2NVZ3VGNvcUl4QT09***
11:30 – 12:00	**In-Person Registration:** EPIC Room 1332 – coffee available
12:00 -12:40	**Introduction:** o General updates – *Mullany* o DLP printer specifics – *Schmid/Tethon* o SLA printer specifics – *Diegel/3DCeram Sinto*
12:40 – 12:45	**Next round of seed funding:** Call details, dates etc.
12:45-13:00	**Quick break –** grab a boxed lunch
13:00- 14:00	**Current Seed Project updates:** o "Discrete Element Method Analysis of Ceramic Powders for Advanced Manufacturing" – ***Shenouda*** */ Abu-Ledbeh (NC A&T)* o "3D printing/Additive manufacturing of photocurable silicone carbide-polymer composite with densified microstructures" - ***Raham****/Joyee/ El-Ghannam (UNCC)* o "Spatial Analysis of Additively Manufactured Ceramic Surfaces" – ***Barrett-Crvich****/ Mullany (UNCC)*
14:00- …	**Lightning talks:** 3 minute slots to introduce interests/capabilities o Mohammad Azad -NC A&T o Youxing Chen - UNCC o Harish Cherukuri - UNCC o Corson Cramer - ORNL o David Diegel - 3DCeram Sinto o Erina Joyee - UNCC o Steve Schmid – UNCC o Flemming Tinker - AOS o Cheryl Xu - NC State o …
…	**Adjourn Zoom – Head to Duke to tour the facilities**
Post Tour	**CPM conference (Duke 108) room for final networking etc.**

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