

# 3D Printing of Bioinspired Flame Retardant Structures

Julia Hong, Alex Kownacki, Ian Greer, Jakob Bradley, Dylan Alves, Yang Yang | Department of Mechanical Engineering | May 6th, 2026

## TEAM MEMBERS



Ian Greer



Julia Hong



Alex Kownacki

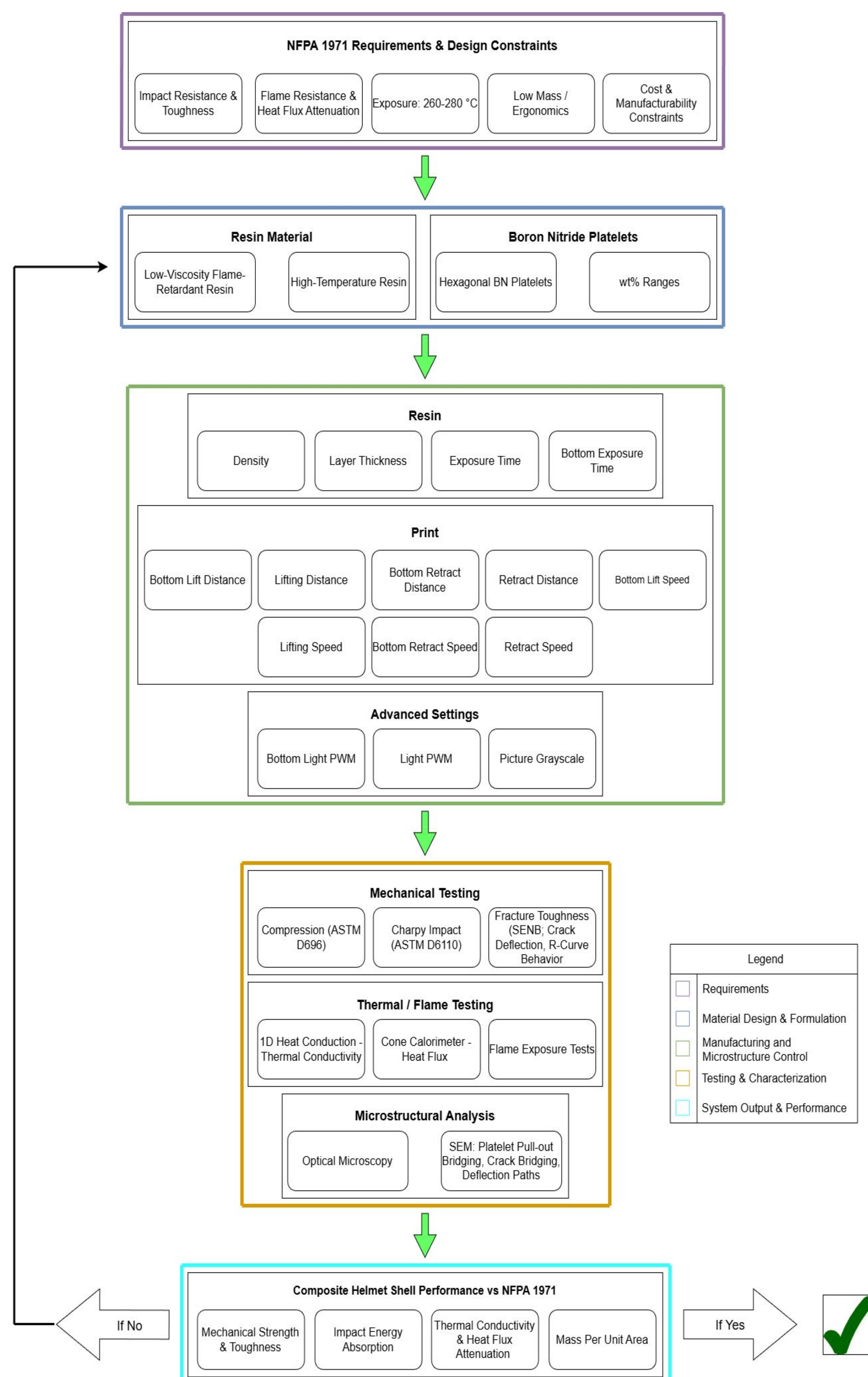


Jakob Bradley

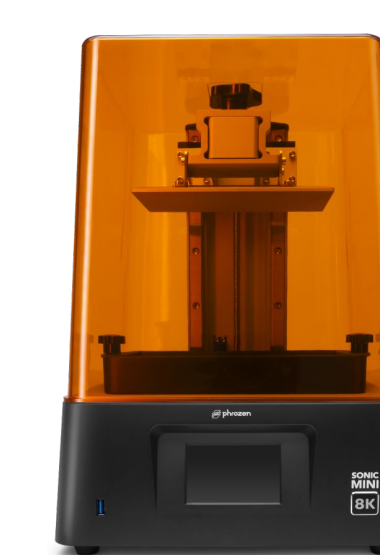


Dylan Alves

## SYSTEM LEVEL DIAGRAM



## FABRICATION EQUIPMENT



Phrozen Sonic Mini 8k



Elegoo Mars 4 Ultra

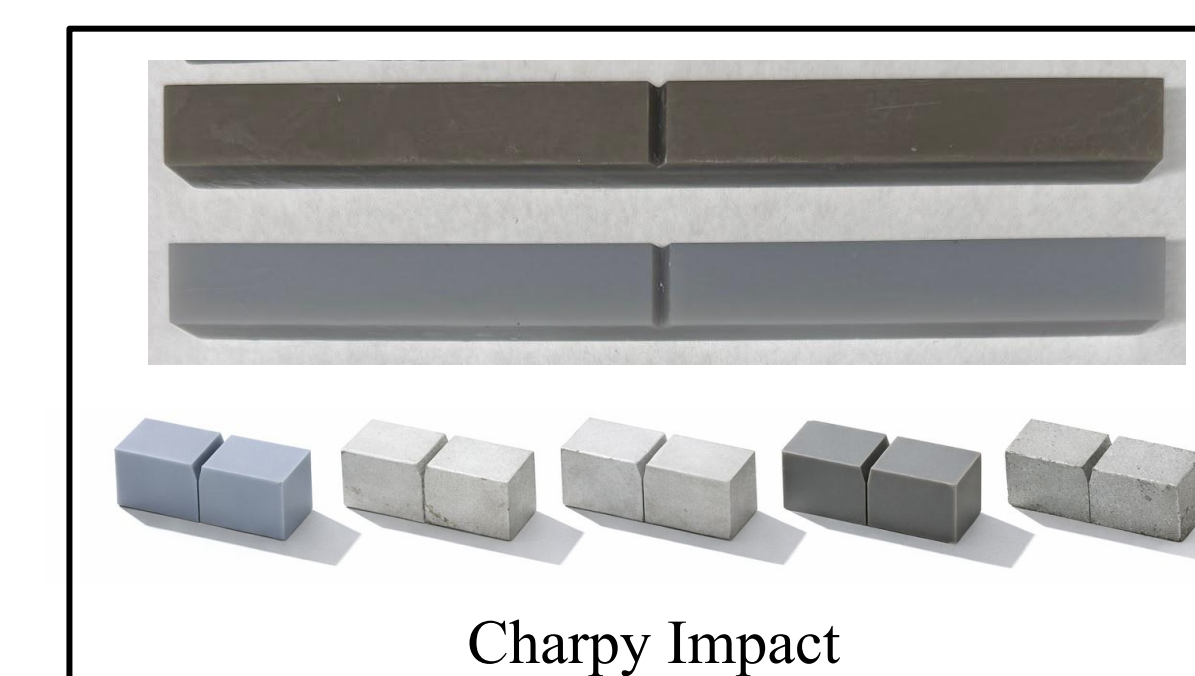


CO-Z Digital Ultrasonic Cleaner

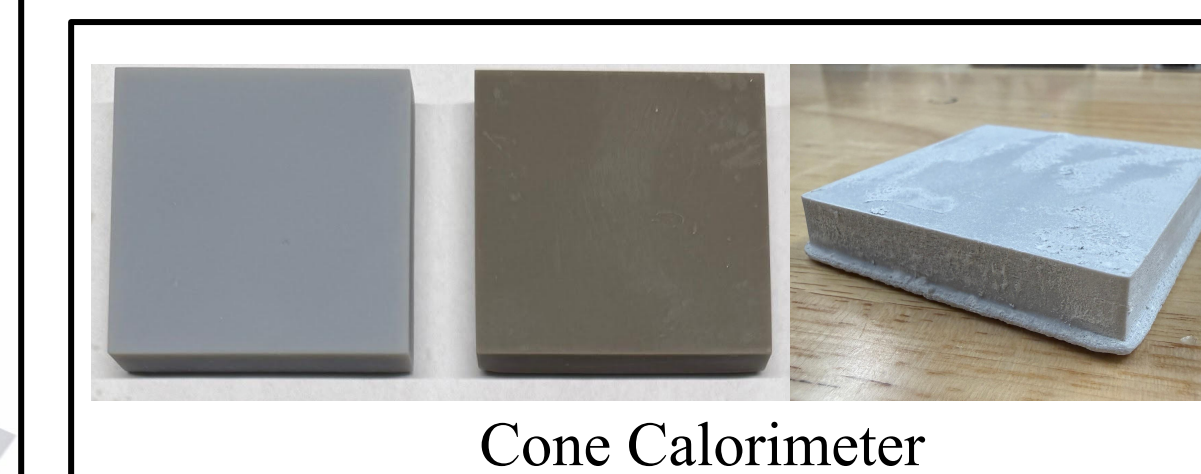


Anycubic Wash & Cure

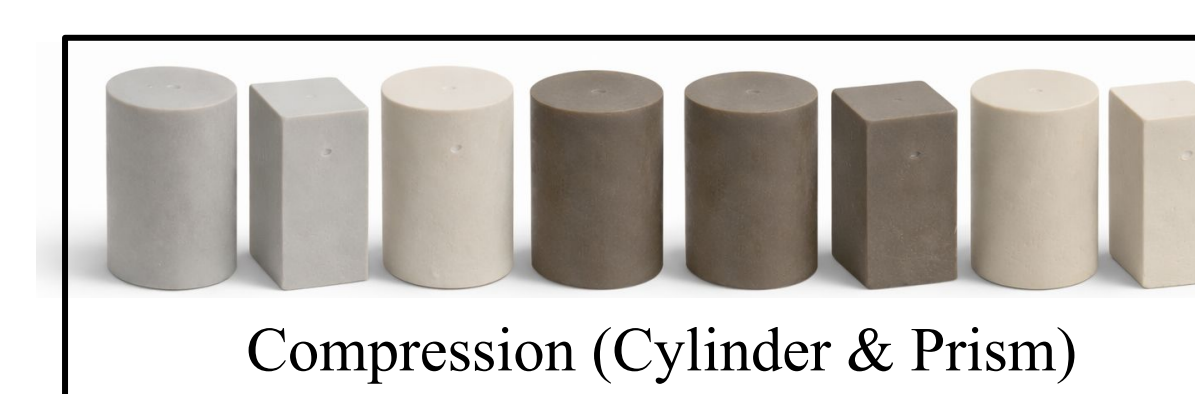
## TEST SPECIMENS



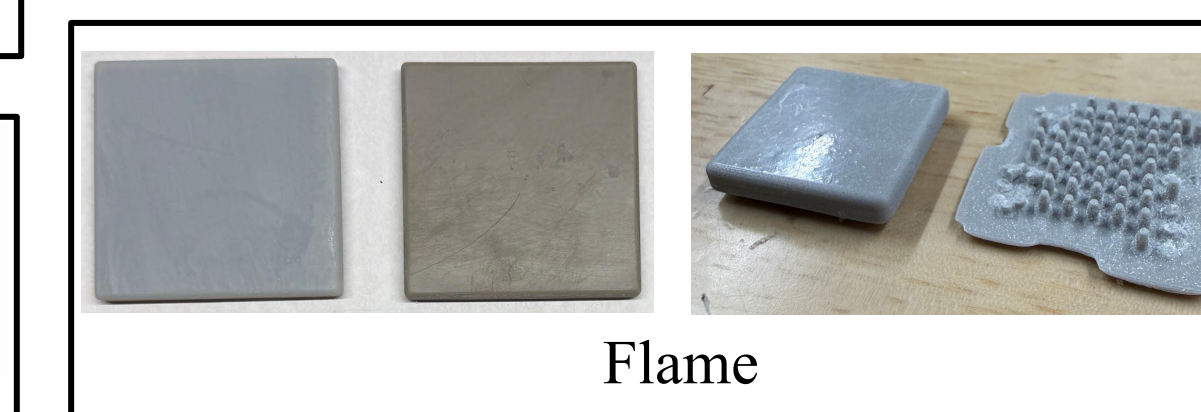
Charpy Impact



Cone Calorimeter



Compression (Cylinder & Prism)



Flame

## MEET THE SPONSOR

**Dr. Yang Yang** is an Assistant Professor in the Department of Mechanical Engineering at San Diego State University. His research focuses on the machine, materials, and structures development for bioinspired 3D printing. He received his B.S. in Physics from Wuhan University in 2009. He completed the joint PhD program at Wuhan University and University of California, Los Angeles in Physics and Bioengineering in 2015. From 2016 to 2019, he worked as a postdoctoral research associate at University of Southern California. Today, he is author to over 36 peer-reviewed publications and he is the reviewer of several journals.

## ACKNOWLEDGEMENTS

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## PROJECT GOAL

This project aims to develop and identify optimized bioinspired hexagonal boron nitride reinforced resin composites to create lightweight, durable, and flame-resistant firefighting equipment materials. The goal is to meet or exceed NFPA 1971 performance standards while reducing costs and improving thermal and mechanical performance.

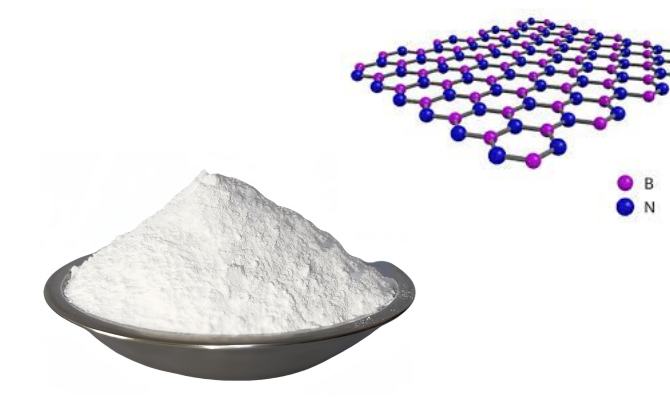
## MATERIALS



Phrozen FR940 Resin

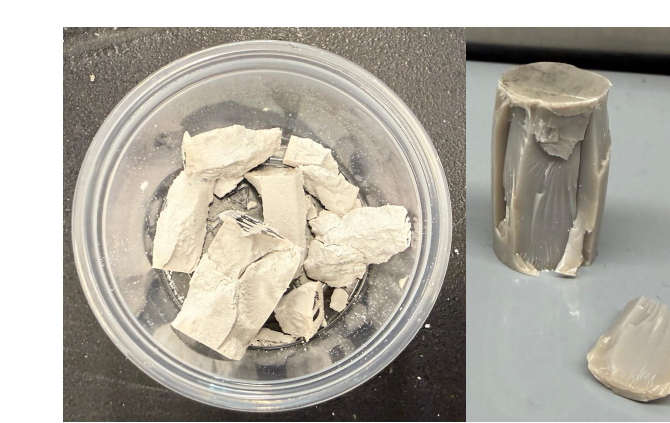


Inslogic High Temp Resin



Boron Nitride Powder

## TESTED SPECIMENS



Compression



Charpy



Calorimeter

## TESTING EQUIPMENT



Cone Calorimeter



Heat Plate & Thermocouples



Charpy Impact Tester



Instron Compression Machine



VHX Microscope



OXFORD X-Max SEM