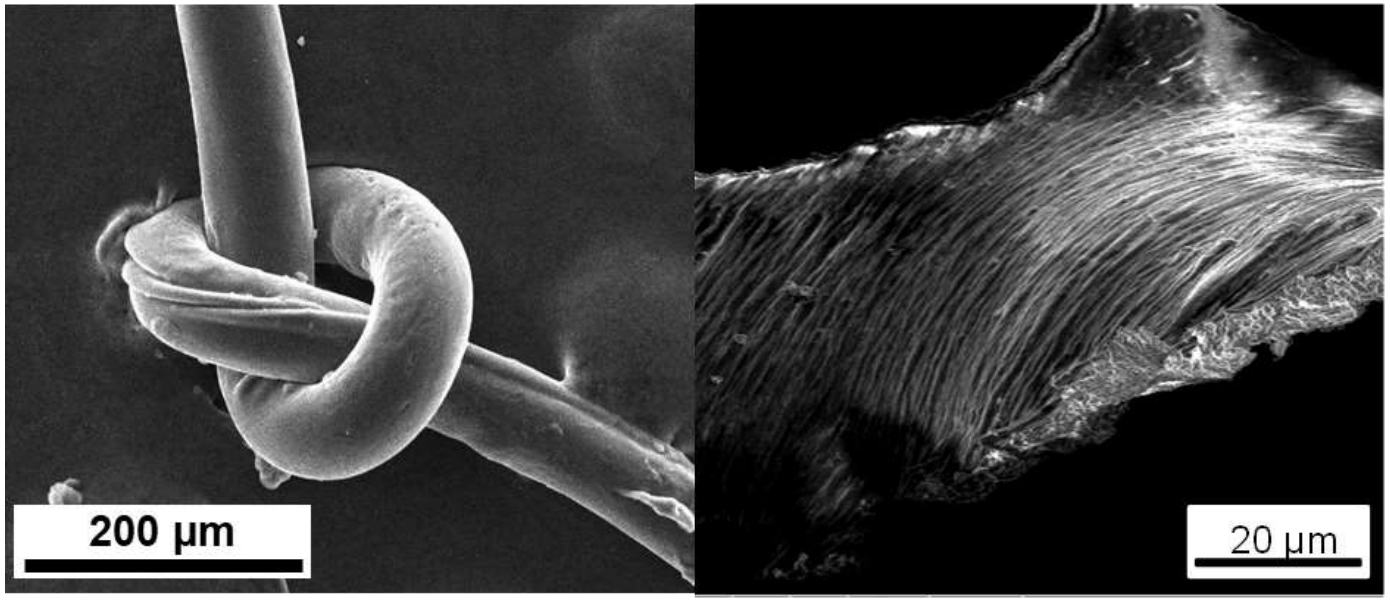
Closing Panel: Addressing Real World Challenges in High Performance Ceramic Material

BioNano Materials Laboratory

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Geyou Ao, Ph.D.
Associate Professor
Cleveland State University



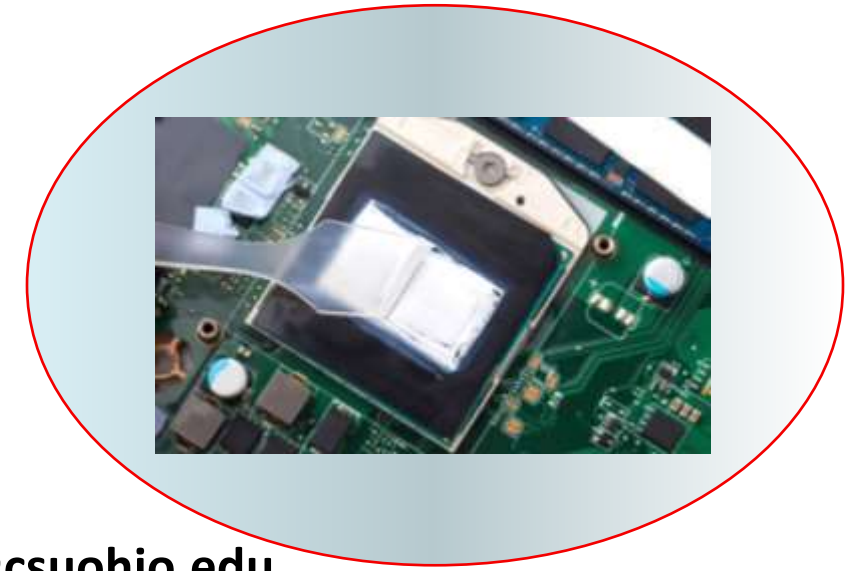
g.ao@csuohio.edu

Challenges in Thermal Interface Materials

Structure-processing-property relationships (e.g., good in-plane/through-plane thermal conductivity)

Assemblies and scale-up of materials with ordered structures and enhanced performance

Thermal Interface Materials (TIM)



Current TIMs

- Nonrenewable materials (e.g., copper, aluminum)
- Synthetic materials are electrically conductive (e.g., graphene)

New materials (e.g., Boron nitride nanomaterials)

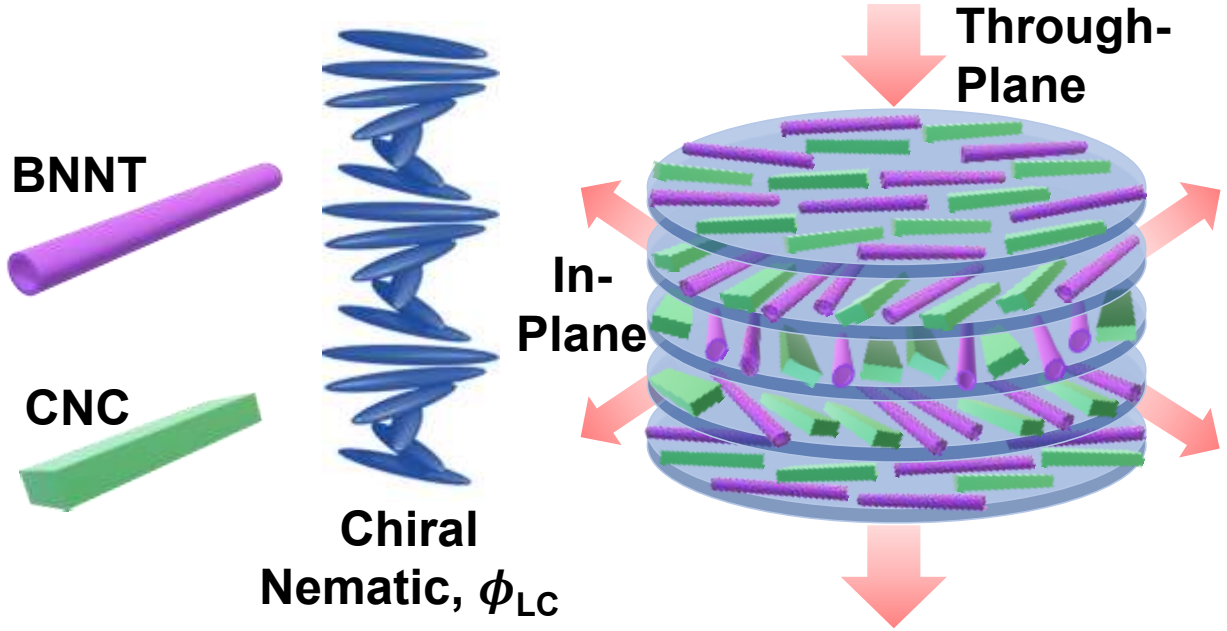
- High thermal Conductivity $\approx$ 200 W/mK
- Wide band gap ≈ 6 eV
- High Young's modulus ≈ 1.2 TPa

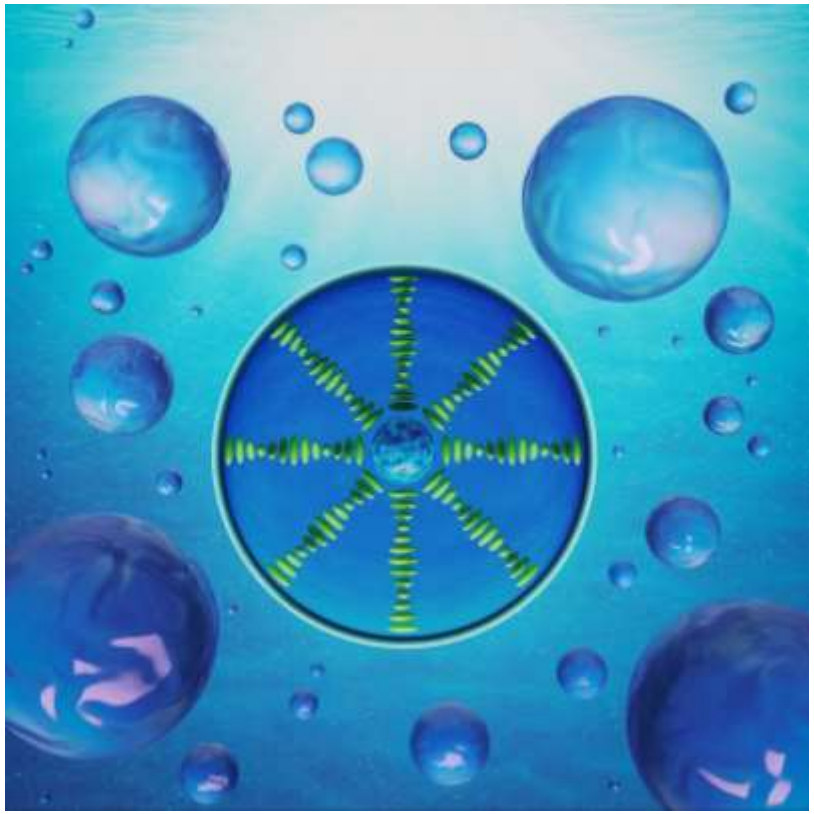
g.ao@csuohio.edu

Aligned Assemblies Using Liquid Crystals

Chiral nematic ordering of building blocks to achieve high thermal conductivity in both in-plane and through-plane directions

Advanced Manufacturing
CMMI-2118416
Nanoscale Interactions
CAREER-2142579





g.ao@csuohio.edu

Next Step: How to Scale-Up?

Additive manufacturing

- Material chemistry
- Self-assembly
- Processing methods
- Mixing
- Costs
- Property translation to final products

g.ao@csuohio.edu