



Ceramic Additive Manufacturing Workshop

Held October 15th and 16th 2020

Output from the two breakout groups on Friday October 16th are provided below

Affinity clusters- derived from the creative matrices:

Tailoring Material Properties- group 1:

- Functionally gradient materials, i.e., tuning the Coefficient of Thermal Expansion via composites
- Stiffness via graded lattice structures, conformal lattice structures
- Coatings

Surface Finish – group 1

- In process surface improvement; multi axis printing systems
- Post process finishing
- Specifications for optical and biomedical applications

Inspection Gaps – group 1

- Inspection of the green body as opposed to the final part
- High speed RT imaging as used in metal AM
- Verification of design specifications

Modeling Tool Requirements – group 1

- Models for understanding material behavior
- Multiscale model for process and postprocess
- Cradle to grave models

Customization – group 1

- Prove clinical outcomes as benefits to costs
- Reimbursement issue – insurance
- Large defect or injury for reconstruction is critical
- Costs

New Materials and Processes- group 1

- General comments on new materials and processes for enhanced performance/cost

New Material Development – group 2

- Ultra High Temperature Ceramics (UTC)
- Ceramic Matrix Composites
- Reflective SiC
- Alumina Zirconia blends (for biomedical applications)
- Feedstock development
- Magnetic ceramics

Functional Components – group 2

- Transmitting IR Glasses
- Transparent armor

- Antenna and Radomes (weatherproof enclosure that protects a radar antenna), RF Transparent
- SiN for RF windows)
- Energy, super capacitors, batteries, heat exchangers

Structures – group 2

- Self-lubrication materials
- Toughness via gradient structure
- Flexible, thin ceramics
- Bio mimic nanocomposite armor
- Gradient thermal structures
- X-ray neutron scattering
- Laminated
- Molding methods for meta materials
- Sintering metal infiltration, polymer infiltration

Laser Based Techniques – group 2

- Flash sintering
- Polishing of AM components
- SLM/EBM for Coatings
- Energy applications

Densification and Post processing – group 2

- Sintering – Flash, Cold, and metal infiltration
- Produce fully dense, hard cutting tools
- Feasibility of HIP-ing printed parts?

Mechanical Property Characterization – group 2

- Impact loading behavior
- Wear and toughness
- Flexures
- Stability

Material to Application Compatibility (bio) -group 2

- FDA approval process – shortlist for human subject testing
- Self-lubricating ceramics

Impact Difficulty Matrices

